EFFECT OF GENERIC AND BRAND PROMOTIONS OF FRESH-CUT FLOWERS ON THE USE OF RETAIL FLOWER OUTLETS

By

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Arbindra Prasad Rimal

I would like to dedicate my dissertation to my parents, Hari Prasad Rimal and Kalyani Rimal.

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EFFECT OF GENERIC AND BRAND PROMOTIONS OF FRESH-CUT FLOWERS ON THE USE OF RETAIL FLOWER OUTLETS

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Chairperson: Dr. Ronald W. Ward
Major Department: Food and Resource Economics

A generic promotion program for fresh-cut flowers and greens known as PromoFlor was implemented in late 1993 with advertising programs starting in 1996. In June 1997 the program was terminated through a scheduled voter referendum among those flower handlers subject to the checkoff assessment. While many issues can be cited that potentially contributed to the negative vote, issues centering around equity are of particular interest. Discussion about the assessment exemption level was an issue where firms with less than $750,000 in sales were exempted. Another equity issue focused on the distribution of benefits within the fresh cut flower distribution system. While the assessments were at the handler level, there were clear benefits closer to the retail level. Did the generic promotions through PromoFlor generate sales gains equitably among the major retail outlets? That is, were the generic efforts "outlet neutral?"

To address the outlet issue, data on household purchases of fresh-cut flowers through all types of outlets were used. Commercial data from the NPD (National Panel Diary) Group included

information on several thousand households reporting details on both the quantity and expenditures on flower purchases, outlet selection, and flower type, along with a wide range of information on household profiles. Using these data, the market share for each retail outlet can be calculated and then used to determine if there is any relationship between the outlet shares and PromoFlor's activities.

Expenditure allocation models using the Almost Ideal Demand Systems (AIDS) specification were used to estimate change in the household expenditures on fresh-cut flowers among the three flower outlets, namely florists, supermarkets, and other outlets. Models were estimated for overall fresh-cut flowers, across four US regions, and across three types of fresh-cut flower products. Models were estimated using maximum likelihood procedures for seemingly unrelated regressions (SUR) and the appropriate price, income elasticities, and market share elasticities were computed. Simulations analyses were carried out to estimate the market share response function of both generic and brand promotions.

Generic promotions of fresh-cut flowers were shown to be outlet neutral in terms of household selection of retail alternatives for buying flowers. Consistent with theoretical arguments, the brand advertising of flowers contributed to a slight positive gain to the florists sector of the flower distribution system. These results follow from using AIDS models applied to four income groups. In addition to the promotional aspects of the share model, many other aspects have been presented and discussed. Among these include the price effects on outlet selection and the projections of longer term outlet shares with growth (or declines) in the total expenditures on fresh cut flowers. Also, the regional differences in responses to the national generic programs were considered and presented. This analysis is for a program that no longer exists. Yet, the insights gained from this type of analysis have important contributions to future directions in dealing with new and/or restructure checkoff programs.

CHAPTER 1
INTRODUCTION

Advertising and Market Demand

Enhancing the demand of a product is generally a main goal of advertising efforts. This goal can be pursued using either generic or brand advertising or a combination of both. Which advertising to choose depends on the type of commodity and market structure for that commodity. Generic advertising is generally used for commodities with homogenous physical attributes and with a competitive market structure. Producers and handlers of commodities bear the individual costs for advertising through a cooperative scheme known as checkoffs. Generic advertising can provide positive information about the commodities such as health benefits, additional usage of products, and other information that may not be available otherwise.

The main objective of generic advertising is to enhance the demand for the products without changing the market shares of the firms in the industry. Although theoretically it is expected that generic advertising is market-share neutral among competing brands, to date there is no empirical evidence to test this dimension of generic programs. The objective of brand advertising is generally to increase the demand for a particular product brand in the product group by encroaching on the market shares of other brands. Thus, a brand advertising effort is mainly to highlight product differences whether such differences may be real or perceived. The attributes of many agricultural commodities and the market structures for those commodities suggest the use of generic advertising. However, in several agricultural products generic and brand advertising is used simultaneously.

Examples of such commodities are orange juice and flowers. Both types of advertising provide information about the attributes of the advertised products.

Effects of both generic and brand advertising on the demand for agricultural commodities and on market shares of the firms in each industry depend on how the advertising affects consumers. The degree and direction of the effects will depend on the individual consumer, structures of product markets, and physical attributes of the product under consideration. An accurate estimate of independent effects of generic and brand advertising are even more difficult when both types of advertising are carried out over the same evaluation period.

In the United States (U.S.), many agricultural commodities have been using generic advertising at the national and local levels to maintain and enhance demand for their products. Examples of such commodities are beef, milk, pork, citrus, catfish, and flowers. Usually these programs are evaluated periodically to determine whether they have achieved their objectives. Often such evaluation studies focus on determining whether the advertising has enhanced the demand for the products. Very little attention is given to determining whether or not generic advertising affects the markets shares among firms within the industry. Studies of the fresh-cut flowers industry provide an opportunity to address the market share issue.

A generic promotion program for fresh-cut flowers and greens commonly known as PromoFlor was implemented in late 1993 and started their advertising programs in 1996. The objective of the program was to expand the total demand for fresh-cut flowers and greens. In June 1997 the program was voted out by the handlers who were assessed by the program. An economic evaluation of the PromoFlor (Ward, 1997) showed that the program was successful in expanding expenditures on fresh-cut flowers. The major issue, therefore, is to determine other economic reasons that caused PromoFlor to be voted out. Was PromoFlor actually share neutral? To address this issue one has to clearly understand commodity promotion programs including the economic theory that explains aspects of such programs.

Problem Statement

PromoFlor was designed to enhance the total value of fresh-cut flowers and greens without significantly changing the structure of the industry. However, over the last several years the retail fresh-cut flower industry seems to have undergone some structural changes. Such structural changes include entry of new types of retailers such as mass-merchandise; introduction and subsequent termination of a national level generic promotion program called PromoFlor; and redistribution of market shares among retailers. Reasons behind such structural change, particularly redistribution of market shares among retailers, are not known. Within the year of its programs, PromoFlor may have contributed to redistribution of market shares. If so, the benefits of the program may have been distributed inequitably along the marketing chain.

PromoFlor was terminated for many reasons, some of which probably will be never known. Yet its potential effect on different sections of the flower industry can be measured. Among many reasons behind the termination of PromoFlor equity may be one. If one section of the industry received a disproportionate share of the benefits that alone could explain why the program failed. For example, did retail florists gain shares over other retail outlets? The data available on this industry provide the opportunity both to study this particular industry and to test the neutrality of generic advertising and impact of brand advertising on the advertising outlets.

Research Objectives

1. The first general research objective is to identify the factors that influence the consumers' decision to allocate their expenditures on flowers among different retail outlets.
2. Second is to describe and analyze changes in the use of retail outlets for fresh-cut flowers across income groups and across U.S. regions.
3. The final objective is to analyze the potential effects of PromFlor and brand advertising programs on changing the relative shares of retail outlets, with the general objective to address the neutrality of generic promotions.

Research Hypotheses

1. Other than the relative prices at retail outlets, many other factors such as generic and brand promotion programs, attitude of consumers about flowers as gifts, buying occasions, and incomes may influence the allocation of consumer expenditures among various retail outlets for fresh-cut flowers.
2. Consumers with higher incomes may look for more of the image attributes in flowers than those with lower incomes. Hence, any response to advertising should differ across income groups.
3. Generic promotion programs are outlet neutral, implying that the impact of PromoFlor on retail outlet selection should be insignificant.
4. The impact of PromoFlor on the market shares of retail outlets may have varied across income groups and U.S. regions.

5. Brand advertising is designed to change market shares of those outlets that provide specialized services, such as offered by florists. The overall impact of brand advertising on retail outlet selection by household consumers should be positive and statistically significant.

Research Methodology

This study used empirical models that incorporated generic and brand advertising of fresh-cut flowers directly into the utility function of consumers. It was assumed that consumers maximized their utility by spending given expenditures for fresh-cut flowers among three different types of retail outlets for fresh-cut flowers, namely, florists, supermarkets, and other types. It was also assumed that these three outlets were differentiated based on the type of services they provided, the image associated with them, and relative prices. Depending on the relationship among the types of outlets, for example, substitutes or complements of each other, allocations of household expenditures on flowers among these three outlets were determined by relative prices and income, and other variables such as generic and brand advertising, flower consumption pattern, and attitudes of consumers. A system of demand equations was used to estimate the parameters and calculate elasticities for each outlet type. An Almost Ideal Demand Systems (AIDS) specification was used to estimate the models. Using the parameter estimates, effects of PromoFlor and brand advertising on market shares of each outlet type and total expenditures on each outlet type were simulated over a range of market conditions.

Data and Scope

Data used in this study were aggregate data collected by the National Panel Diary Group (NPD) and sold through the American Floral Endowment. Data on retail sales and the number of buyers of flowers were based on a consumer panel of several thousand households who reported their purchases of flowers, including those who did not purchase flowers. These data included details on who did and did not buy flowers, how much they paid, the types of flowers bought, and when and where they were purchased. The data were collected across several thousand households for 56 months from July 1992 to February 1997 for all types of outlets in the cross section. It was then projected to represent different aggregate levels including national level using weights that characterized the common attributes of the group. The weights used in aggregating the household data are all based on demographic characteristics. The weights are the propriety of NPD, hence were not disclosed. The data available for this study, therefore, were in aggregate forms. Potential buyers of fresh-cut flowers in U.S. households were aggregated into four income categories with income 1) under $25,000; 2) $25,000 to $49,999; 3) $50,000 to $74,999; and 4) $75,000 and above. Flower purchases were recorded for each group along with prices, purchase period, and other economic factors. Although models used in this study were based on household demand, the data used for empirical analyses were market data. Issues relating to the characteristics of individual demand functions to the aggregated or market demand function are discussed in brief in Chapter 5.

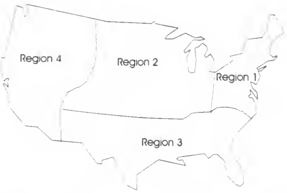


Figure 1-1: Division of U.S. cut flower market into four regions in order to analyze effects of generic and brand advertising.

The study covered all types of retail outlets through which flowers were purchased by households. Retail outlets were grouped into three types: florists, supermarkets, and others. Others included convenience stores, discount chains, department stores, drug stores, garden centers, home improvements/hardware store, mail catalogs, street vendors, toll-free number services. Since Ward (1997) clearly showed differences across income groups, the models were estimated across four income groups as defined above. The analysis was carried out for overall fresh-cut flowers and three specific types of fresh-cut flowers: arrangements, single stems, and bunches/boxes/corsages. The analysis focused on the overall fresh-cut flowers sold through three different types of retail outlets to consumer households belonging to four different income groups. A secondary level analysis was carried out to evaluate regional differences across four different U.S. regions: North, Central, South, and West (Figure 1-1), and product-wise differences across three specific types of fresh-cut flowers: arrangements, single stems, and bunches/boxes/corsages.

The scope of the study is limited to household consumption of fresh-cut flowers in U.S. It does not include institutional consumption. In terms of dollar expenditures households constitute approximately 25 percent of the total fresh-cut flower retail market. The second limitation of the study is the number of years PromoFlor was implemented. The actual expenditures on PromoFlor involve fourteen months only. This limitation is due to the fact that the program was terminated within short period of implementation.

Importance of the Study

1. The success of a commodity promotion program may be measured in terms of efficiency and equity. Most studies evaluating the impact of commodity promotion programs have focused on the efficiency of the programs. This study focused on the equity aspect of the PromoFlor

program. Although, the analysis did not actually measure the distribution of program benefits among the agents along the marketing chain, it provided evidence of any differences in benefit distribution among outlets.

2. Understanding demand for flowers is useful also at the firm level. Marketing managers of a large retail outlet may be better equipped to evaluate marketing programs given information about fresh-cut flower products in terms of several key elasticities.
3. This study provides feedback to American Flower Endowment (AFE) regarding several uses of the ongoing data base on household consumption of floral products.
4. This is one of the few studies evaluating market shares of outlets using the demand system approach. Therefore, the study provides a methodological contribution to the literature.
5. Many existing demand studies using linear expenditure systems (LES) fail to account for all of the individual goods in the group, which may be either substitutes or the complements. This usually occurs because of data limitations. Such omission has serious implication from the theoretical and empirical point of view. In this study all types of retail outlets selling most types of fresh-cut flower products are accounted for.

Overview

The second chapter of this study contains a review of literature on commodity promotion programs, generic and brand advertising, approaches to estimate market shares, and use of demand models in estimating effects of advertising on demand of agricultural commodities. A special focus is given on the applications of the AIDS models. Although, there are only a few research papers on the area of the fresh-cut flower industry, summaries of the previous works will be presented. The third chapter describes the flower industry and its structural dimensions. Chapter four contains conceptual and theoretical models and their properties. Econometric models, estimation techniques, and descriptions of data are included in chapter five. Chapter six includes results from the econometric estimations and a general discussion of the significance of estimated coefficients. Chapter seven focuses on the estimated price, income, and share elasticities of demand and their interpretation in the context of the research objectives. It includes simulation analysis with respect to change in prices of fresh-cut flowers and total expenditures on fresh-cut flowers and their impact on relative market shares. Research hypotheses are tested using these elasticities. An evaluation of PromoFlor and brand advertising using the estimated promotion elasticities is presented in chapter eight. Simulation analyses with respect to changes in promotion expenditures and their impact on relative market shares of retail outlets are presented. The ninth and final chapter includes the summary, conclusions, and recommendations. Supporting tables and econometric programs are included in the appropriate appendices.

CHAPTER 2
LITERATURE REVIEW

This chapter consists of four sections starting with a brief overview of different commodity promotion programs. A literature review of selected studies that deal with advertising of agricultural commodities is then provided. The third section reviews how advertising affects demand for the commodities and presents different demand models, and model specifications. Issues of advertising and market shares follow in the fourth section. Finally, a review of the literature dealing with the fresh-cut flower industry is presented.

Generic Advertising of Agricultural Commodities

A large amount of money is spent annually on advertising and research to maintain and expand demand of agricultural commodities in the U.S. For example, promotion expenditures for national cheese promotion programs from 1984 to 1996 totaled more than $400 million (Blisard et al., 1997). Commodity promotion programs, a large part of which is generic advertising, can be funded and managed entirely by producers or tied to USDA regulatory programs such as marketing orders. These programs at both the state and federal levels may be mandatory requiring producers to participate through a commodity assessment. Ultimately, producers can vote to continue or terminate the programs.

Funds for generic advertising programs are met through producers checkoff programs, voluntary contribution from producers and handlers, and in some limited cases direct appropriation from federal or state governments (Forker and Ward, 1993). Checkoff assessment rates are specified by the legislative authority with a limit in absolute or percentage terms. The assessment is usually on a per unit of sales basis either in volume or in dollar units. For example, the milk promotion program assessed fifteen cents per hundredweight of marketed milk, while pork promotion assessed 0.10 to 0.50 percent of market value of pork (Table 2-1). Along with checkoff rates, coverage of the volume marketed is specified for each promotion program.

Table 2-1: Federal commodity promotion programs: assessment rates and coverage.

Commodity	Authorized Rates	Coverage
Beef	$1 per head	All cattle producers and importers
Cotton	$1 per bale plus up to 1% of bale value	Producers and importers
Dairy	$0.15 per cwt.	Dairy farmers
Eggs	Up tp $0.10 per 30-dozen case	Producers with 30,000 or more laying hens
Pork	0.25% of market value; may increase by 0.1 annually, not to exceed 0.50%	All producers of porcine animals and importers
Watermelon	Fixed by secretary of agriculture; not to exceed $0.02 per cwt.	Handlers and producers growing 5 or more acres.

Source: Forker and Ward, 1993.

There are two aspects of the coverage. The first is the economic agents in the vertical marketing system assessed by the check-off programs and the second is the cutoff limit on the volume of operation. Generally assessments are only at the producers/ wholesalers/handlers levels. Retailers are not generally assessed. Thus, some agents in the vertical marketing chain may enjoy benefits of the programs without being subject to the assessments. There may be a cutoff limit based on volume or value of sales. Firms subject to assessments depend on the minimum criteria in terms of amount of sales revenue or quantity sold. Small firms with less than minimum sales revenue or quantity sold are exempt from the assessments. Imports are usually subject to the assessments in equivalent units to the domestic production. The role of the government in these programs is, for the most part, oversight in nature. Participants subject to the assessment periodically vote to decide whether to continue the programs. These programs are implemented at the national, state, and regional levels. Some well-known commodity checkoff programs include beef, milk, almonds, eggs, flowers, citrus, and honey.

Roles of Advertising

Promotion of goods and services is one of the four elements of marketing mix, the other three being productions, pricing and placement. Ward et al. (1985) classify promotional effort into two broad categories of emphasis. The first is directed to disseminating information about the particular characteristics of a given "brand" of the commodity. The second may be a cooperative effort of the commodity producers and/or the other agents in the marketing chain in trying to enhance the demand of the commodity via "generic advertising." Both brand and generic advertising intend to provide information about the product attributes. However, there may be considerable differences between them in terms of their impact on the demand. The relative effects of generic and brand activities depend on the attributes of the good being promoted. Decision about which type of promotion program is appropriate is based on product differentiation and acquisition of information. Figure 2-1 shows a continuum of selection between brand and generic advertising when a product is cooperative or predatory. Cooperative goods produced by different firms cannot be differentiated. Advertising can potentially increase total demand for the product but cannot increase firms' shares. With predatory goods, total market demand cannot be increased but one firm may gain market shares from another. The two end sections in Figure 2-1 represent extremes when either only generic advertising or brand advertising can be used. There is, however, an area of overlap where firms may use generic and brand advertising together.

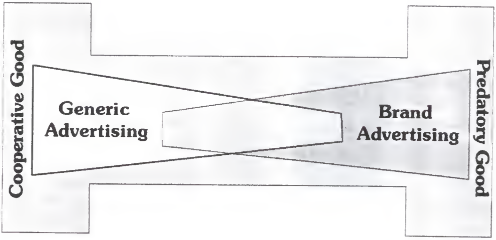


Figure 2-1: Generic and brand advertising among commodity classifications (source: Ward, 97).

Nelson (1974) classified goods into search and experience goods in terms of information needed by the consumers to make purchase decisions. Search goods are those about which consumers are willing to dispense with time and money to acquire information. These goods are usually expensive and are bought infrequently. Most consumer durables fall into this category. Examples of search goods are automobiles, refrigerators, and micro-wave ovens. Experience goods are those that consumers actually consume to evaluate the positive attributes claimed in the advertising messages. These goods are usually inexpensive. According to Nelson (1974) the types of advertising for these two groups of goods are quite different. Experience goods are advertised using indirect information, while information for search goods is direct and specific.

Most agricultural goods are close to being cooperative and experience goods. Often both brand and generic advertising are found within many commodity groups. Examples are orange juice, and apples. A firm's advertising combination depends on its marketing goal, for example, to build market shares or to expand the market (Catherine and Bolton, 1996). If a product is close to being a cooperative good, firms in the industry can increase the demand for their product by increasing the overall demand for the industry. However, if information about the product is not fully known to the consumers, firms may use brand type of advertising by disseminating select characteristics of the product. Different firms emphasize different characteristics for being closely associated with their product that indicates pseudo differentiation (Lancaster, 1979). All combinations of brand and generic advertising may increase demand for firms' products, either by increasing the total market size or by increasing the share within the market. An important question is how advertising, generic and brand, affects the demand for agricultural products. The second question is whether both generic and brand advertises have the type of effect consistent with theory.

Several studies have addressed the economic impact of generic advertising on the demand for commodities. Often these studies are part of the periodic evaluation of the programs. Many studies have estimated rates of return on advertising expenditures. A rate of return is an increase in the producers' profits on the advertised commodity divided by the total expenditures on advertising. In other studies relationship between advertising and consumption of advertised commodities is estimated. For example, in a study of the impact of fluid milk advertising, Ward and Dixon (1989) reported a significant positive relationship between fluid milk consumption and generic fluid milk advertising. Table 2-2 reports key conclusions from several studies evaluating the impact of generic advertising for different agricultural commodities.

Table 2-2: Summary of findings of impact evaluation of generic advertising.

Commodity	Authors	Impact	Rate of return
Egg	Schmit et al. (1997)	Positive	6.9%[1]
Fluid Milk	Kaiser, H.M. and Roberte, J.C. (1996)	Positive	N.C.
Catfish	Kinnucan, H.W, Venkateswaran, M.(1990)	Positive	N.C.
Beef	Ward, W.R. (1994)	Positive	5.70:1[2]
Fats and Oil	Cox, T.L. (1992)	Negative	NC
California Table Grape	Alston et al. (1997)	Positive	84.2:1 to 80.3:1[3]
California Prune	Alston et al. (1997)	Positive	2.65:1[3]

1=Return on producers' profits

2=Every $1 spent on advertising increased industry revenue by $5.70

3=Marginal benefit cost ratio: additional producer profits for additional dollar spent on promotions

NC=Not Calculated

The simulation results of Schmit et al (1997) for egg promotion showed that a 1 percent change in real advertising expenditures resulted in 0.13 percent increase in the producer prices, which translated into 6.9% rate of return. In another study of generic advertising of beef, Ward (1994) estimated a return of $5.70 in industry revenue for every $1 spent on generic advertising. Kinnucan and Venkateswaran (1990) found a positive relationship between generic advertising of catfish and the attitude toward it. They concluded that because of generic advertising catfish consumption at home and restaurant increased. Kaiser and Roberte (1996) estimated elasticity of generic advertising for whole, low-fat and skim milks. They concluded that generic fluid milk advertising has a positive impact on demand for whole, low-fat and skim milks. Cox (1992), however, found an inverse relationship between generic advertising and consumption of fats and oil using data for fats and oil consumption in Canada.

Firms may use both generic and brand advertising to enhance the demand for their products. However, the roles of these two types of advertising in the changing marketing environment facing the industry and firms are theoretically different. Lee and Brown (1992a) and Ward (1992) assessed the impact of both generic and brand advertising on the demand of orange juice. They lumped advertising into two categories based on expenditures: generic advertising was funded by the Florida Department of Citrus and brand advertising was funded by major processors. Lee and Brown (1992a) found that (1) both brand and generic advertising increased sales of orange juice significantly; (2) generic advertising had significant impact on the total industry demand for orange juice; (3) brand advertising had significant impact on brands' market share but did not have impact on the industry demand for orange juice. In contrast, Ward (1992) found that brand advertising had greater impact on the industry demand for orange juice than generic advertising. Ward also concluded that although brand switching had little to do with the effect on the total market, brand advertising had some effect in shifting market shares from private labels to brands.

The empirical results (Table 2-2) and the subsequent discussions show that several agricultural commodities were positively affected by generic and brand advertising. The next question is how does it happen? Most economists agree that advertising affects demand for a product by changing the consumer's tastes and preferences. Therefore, the answer to the question may be found in the literature of demand theory.

Advertising and Demand Theory

Among the first to analyze advertising impact on demand of goods was Chamberlin (1965), who used a monopolistic competition model. The model included market price, product differentiation, and selling costs including advertising and promotions. Selling costs affected demand for foods and services as a demand shifter while other production costs formed the supply curve. Recent works dealing with the impact of advertising on demand take two main approaches in incorporating advertising into the analysis. The first approach assumes advertising to be one of the components in consumers' direct utility functions (Dixit and Norman, 1978; Green, 1985). The second approach uses household production theory in incorporating advertising into the analysis (Stigler and Becker, 1977).

The utility function of a consumer represents his or her preference ordering among different bundles of goods. Economists assume that consumers maximize their utility subject to a given budget. In effect it is the constrained maximization, which yields a set of demand equations showing how a consumer actually behaves. Dixit and Norman (1978) introduced advertising directly into the utility function and evaluated social welfare under pre and post advertising market equilibria. One of their findings was that a profit maximization level of advertising is excessive under all market structures. Green (1985) incorporated advertising directly into the model, but used a dual approach in deriving set of demand equations. Under this approach a consumer minimizes expenditures on goods and services given his or her utility.

Under the household production approach utility is assumed to be a function of nonmarket goods such as the basic attributes of the goods under consideration (physical characteristics, nutrition, image, and prestige). A consumer produces nonmarket goods from market goods with labor and capital inputs. Capital inputs include stock of knowledge. Advertising can be a source of stock of knowledge. Lancaster (1971), and Kotowitz and Mathewson (1979) developed demand models using a household production approach where utility is a function of product characteristics rather than products themselves. Nichols (1975) evaluated consumer welfare consequences due to advertising by introducing advertising indirectly in the utility function using a household production approach. His work showed that social welfare is not related to market goods but to the structure of the characteristics of the goods consumed. Advertising may influence the welfare of a consumer by influencing the structure of the characteristics of the goods consumed. Two general approaches are adopted in specifying advertising in demand systems: including advertising effects in systems of demand equations derived from duality theory using more flexible functional forms such as translog indirect utility or AIDS (Deaton and Muellbaur, 1980); or incorporating advertising into a system of demand equation based on a differential approach (Theil et. al.,1989; Barten, 1977). Examples of the first approach include Chang and Kinnucan (1992); Duffy M. (1995); Green et al. (1991); Piggott et al. (1996); Rickertsen et al., 1995; and Richards T. (1997). Examples of the second approach include Brown and Lee (1993, 1997); Duffy (1987); and Selvanathan (1989).

Many AIDS and differential models incorporating advertising treat advertising as a preference or quality shifter (Brown and Lee, 1993). This approach of incorporating advertising is also known as scaling and translating. Similar to Stigler and Becker (1977), it can also be interpreted as advertising changing the shadow value of nonmarket commodities in a household production context. In the context of market goods, advertising generates price and/or income effects. Brown and Lee (1993) provide an extensive treatment of scaling and translating by incorporating advertising in the direct utility function which will be further discussed in Chapter 4.

The next issue in incorporating advertising in demand models is the shape of advertising decay structure. Many authors have assumed varying type of marginal impact of advertising expenditure, hence, varying types of decay structures. Lee and Brown (1992b) have grouped lag structure assumptions made in the literature into four groups: zero lag effect; monotonic decreasing lag structure; bell-shaped lag structures; and monotonic increasing structure. Thompson and Eiler (1975), Hockman et al. (1974), and Ward (1975) emphasized the shape of the advertising function rather than the lag structure. They use the inverse of advertising expenditures or logarithmic advertising expenditures with the assumption that advertising impact increases at a decreasing rate.

This allows for a concave shape of the advertising function. The second and third group of literature use data to determine length and shape of lag structures. Examples include Ward's polynomial lag structure (Ward, 1976), the lagged dependent variable approach (Lee and Fairchild(1988), and the Pascal lag used by Kinnucan and Forker (1986). The fourth group assumes that effect of advertising is not instantaneous and effect of advertising occurs after a lapse of time (Liu and Forker, 1988; Ward, 1993). Lee and Brown (1992) using grapefruit data concluded that for frequently consumed commodities, the lag structure of advertising commodities should take the shape of a monotonic decreasing function.

The other important issue relates to household budget survey data used in expenditure allocation models. Deaton and Irish (1984) raised possibilities of misreporting by households including both under and over reporting of expenditures particularly in studies relating to developing countries. Observed zero expenditures occurred either because households genuinely did not buy the good or the expenditures were not recorded. Deaton and Irish used a single equation tobit model to test for the presence of zero expenditures in Family Expenditure Survey data among others. The authors found that test results not only rejected the existence of such misreporting in data set but also that standard tobit model cannot account for apparently quite general features of such data.

Advertising and Market Shares

A firm's market share is a share on expenditures of potential consumers who are buyers of products or services. However, in most empirical analysis market shares is defined as actual consumers, expenditures on goods and services rather than potential consumers. This concept of market shares may be more explicitly stated in the following manner:

(2.1) $$S_i = Q_i / Q$$

where S_i = the market share of firm i, Q_i = the sales (quantity sold or dollar volume) of firm i's product, Q = the total sales (quantity sold or dollar volume) for the market, $\sum_{i=1}^{m} Q_i$ and m= the number of competing firms.

There are mainly two schools regarding the effect of advertising on market shares (Albion and Farris, 1981, 1987). Advertising can cause firms' demand to be more inelastic, thus, giving firms more market power. In contrast, advertising provides information to the consumers about the goods and services, thereby making the market more competitive or demand for the goods more elastic. Bain (1972) explained that advertising may impede the entry of new firms in the industry thus allowing the existing firms to enjoy market power at least in the short run. If advertising is subject to significant economies of scale, new firms may be required to enter the markets on larger scales than otherwise to achieve minimum average costs. Effect of advertising on market shares is not so clear cut. Although some earlier work (Kaldor and Silverman, 1948; Mueller and Rogers, 1964) reported evidence that advertising is associated with increased industrial concentration, Ward and Behr (1980) concluded that there exists a positive relationship between advertising and concentration. Some of the later works (Eckard, 1987), however, do not support the hypothesis that advertising increases market shares of advertising firms. To the contrary, it was found that advertising and promotional activities on balance work to increase the competitiveness in the industry over a long period. The literature in industrial organization deals exclusively with the brand advertising and its influence on the firm's market share; it says a little about generic advertising. The objective of a brand advertising is to create product differentiation and allow firms to exercise market power. The generic advertising provides information about the commodities, thus, is an inexpensive means for conveying information to consumers. As a result generic advertising is expected to stimulate competition and diminish market power (Ward et al., 1985).

Studies on U.S. Fresh-Cut Flower Industry

Some of the earliest studies (Sherman et al., 1956; Garbarino, A.J., 1963) evaluated consumers' preferences and attitude toward fresh-cut flower products. Since those studies the fresh-cut flower retail industry has undergone many changes. Among them is entry of mass market retailers such as supermarkets, and department stores in the industry. While in the early days the role of supermarkets in the fresh-cut flower industry was mainly to alleviate seasonal surpluses in flowers, they now maintain 12 to 15 percent of total flower retail market (Goodrich, 1980; Kress, 1987).

Miller (1983) carried out an extensive sub-sector analysis of the U.S. fresh-cut flower industry. The study used a structure-conduct-performance framework to analyze existing industry and to predict the future trend. Miller (1983) and Smith and Miller (1983) observed rapid growth of mass markets in the fresh-cut flower retail industry during the seventies and eighties, and predicted that their role in the future of the industry would become much more important. Becker (1993) and Behe (1989) studied the floral retail industry at a regional level mainly addressing issues relating to buying behaviors of flower consumers. Behe (1989) recommended three ways of segmenting retail flower markets based on buyers attitude toward flowers, income, and other demographic factors in Pennsylvania: 1) segmentation by product (fresh-cut flowers versus potted plant customers); 2) segmentation by volume of purchase (light, medium, and heavy consumers); and segmentation by location of purchase (supermarkets versus florists). Becker (1993) presented differences in service quality between supermarkets and florists as perceived by consumers in Texas. The study measured differences between the types of retail outlets in terms of types of products sold, custom design and other in-store services, delivery, and convenience. Becker's results showed significant differences between florists versus supermarkets: (1) florists carried more nonperishable items than supermarkets; (2) 99 percent of florists provided custom design compared to 87 percent of supermarkets; (3) 99 percent of florists offered delivery compared to 41 percent of supermarkets; and (4) more supermarkets provided convenience, for example, open seven days a week, and longer hours than florists.

Behe et al. (1992a, 1992b) analyzed flower buyers at supermarkets using factor analysis. The objective of the study was to determine the factors influencing flower buying decision of supermarket consumers. They condensed those factors into a few that represented the most important influences on floral buying decisions. The results of the study were useful in defining market segments among supermarket floral customers.

Ward (1997) evaluated PromoFlor's impact on the demand of fresh-cut flowers and greens using U.S. household data on flower consumption. The study defined change in flower demand in two ways: 1) change in number of buyers from period to period with the entry of new buyers and increases in the number of buyers with history of purchasing flowers, and 2) changes in purchases per buyer. The study asked whether PromoFlor attracted additional buyers to the market and whether it generated additional purchases per buyer. Following were the conclusions of the study:

1. PromoFlor affected fresh-cut flower demand although the effects differed considerably across income groups. Positive gains in sales of flowers occurred among households with incomes less than $75,000. Households with incomes more than $75,000 did not show a response to PromoFlor programs.
2. The study estimated a net gain of $5.6 in additional revenues at the handler level per dollar of expenditure on generic advertising.
3. The gains resulted from increases in the number of buyers and purchases per buyer. Gains due to additional buyers were as high as 70 percent in the lowest income group, while it was

about 50 percent in two other income groups: \$25,000 to less than \$50,000, and \$50,000 to less than \$75,000.

4. PromoFlor produced an estimated 10 percent increase in the number of households buying fresh-cut flowers in a typical month. More than 40 percent of these additional buyers were within the lowest income group.

Summary of Literature Review

Generic promotion programs are implemented for many agricultural commodities to maintain and expand demand for those commodities. For many of the commodities the actual impact of the programs has been evaluated. The focus of such evaluation has been primarily on the efficiency aspect of the programs quantified in terms of dollar value. In this regard many studies have concluded that there is a positive relationship between generic advertising and the demand for the commodities. While some commodities have not benefitted significantly from generic advertising, many generic promotion programs have been successful. Generic advertising for fresh-cut flowers, PromoFlor, was found to have affected positively on the U.S. fresh-cut flowers and green industry.

Although a range of theoretical and empirical methodologies have been applied in evaluating the impact of advertising, all studies assume that advertising impacts the demand for the commodities by altering the preferences of consumers. This role of advertising is depicted either directly through the utility function of consumers or indirectly through the household production models. In terms of empirical models some studies have used single equation models with various functional forms. Many of the studies have used demand system approach to evaluating the impact of advertising.

Translog, Rotterdam, and the AIDS are more popular demand system specifications adopted in the literature.

On the one hand advertising is described to be reinforcing competitive market structure by providing information about the products, while on the other hand some authors have found a positive relationship between advertising and market concentration. Most of the studies on advertising and market shares relate to brand advertising. None of the studies have addressed the issue relating to generic advertising and market shares. Therefore, this research is expected to contribute to the body of knowledge by addressing this important equity issue.

CHAPTER 3
AN OVERVIEW OF U.S. FRESH-CUT FLOWER INDUSTRY

The objective of this chapter is to provide description of the U.S. fresh-cut flower industry. The first section includes present state of the industry, trends over the past years about supply and demand, and price patterns of fresh-cut flower products. The second section deals with the vertical marketing system in fresh-cut flower industry including growers, wholesalers, handlers, and retailers. Retail outlets of fresh-cut flower products are described in the third section. Finally, the flower promotion program "PromoFlor" is described.

Supply and Demand of U.S. Floral Products

Supply of Floral Products

The United Sates is the largest producer and consumer of floral products. Although the per capita expenditures on floral products of the European countries are higher, the U.S. leads the world on a total expenditure basis. In 1996, the U.S. fresh flower production, which included fresh-cut flowers and potted flowering plants, was estimated at a value of $1.5 billion.

U.S. retail expenditure on fresh-cut flowers alone was estimated to be $6.5 billion (Economic Research Services, 1997). According to a report published by the USDA, U.S. floral markets (fresh-cut flowers, cut greens, and potted flowering and potted foliage plants for indoor uses) were the largest in the world with an estimated value of $12 billion in 1994. Japan was second with retail floral expenditures estimated to be $10.8 billion.

Annual per capita retail expenditures on floricultural and environmental products were $140.40 in 1996. Per capita retail expenditures on fresh-cut flowers alone were $26.79, which was about 50 percent higher than the 1986 level (Table 3-1). From 1986 to 1996 the annual average growth in the per capita retail expenditures on floriculture and environmental products was 6 percent. During the same period, per capita retail expenditures on fresh-cut flowers grew by an average annual rate of 5 percent.

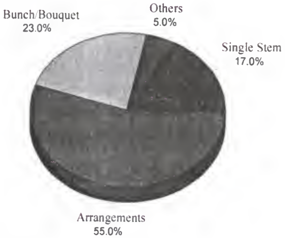
Table 3-1: U.S. fresh-cut flowers industry (1986-1996).

Year	Value of Domestic Production	Value of Imports	Value of Retail Expenditures	Per Capita Retail Expenditures[1]
	----------------------------------	---$'000---	----------------------------------	
1986	$492,585	$254,025	$4,174,997	$17.39
1987	$594,478	$267,959	$4,802,840	$19.82
1988	$617,160	$305,137	$5,155,358	$21.09
1989	$671,103	$328,578	$5,641,348	$22.86
1990	$649,891	$339,893	$5,505,010	$22.07
1991	$658,143	$335,069	$5,503,087	$21.83
1992	$645,104	$367,363	$5,638,657	$22.11
1993	$610,960	$402,594	$5,665,285	$21.98
1994	$635,460	$439,962	$6,032,846	$23.17
1995	$607,400	$535,577	$6,437,765	$24.84
1996	$642,220	$600,127	$6,531,058	$26.79

Note1: Based on U.S. Bureau of Census resident population estimates as of July 1.
Source: Economic Research Services, USDA, 1997.

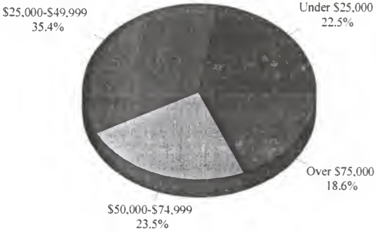
Household Expenditures on the Retail Floral Products

U.S. household expenditures on flowers were evaluated using the data collected by National Panel Diary Group (NPD) and sold through the American Floral Endowment. NPD data were based on a consumer panel of several thousand households who reported their purchases of flowers. The information included who did and did not buy flowers, types of floral products, amount paid and



Source: NPD group, 1993-1996.

Figure 3-1: Distribution of household expenditures on fresh-cut flower products.



Source: NPD group, 1993-1996

Figure 3-2: Distribution of household expenditures on fresh-cut flowers according to income group.

outlets chosen to buy floral products. In terms of household expenditures, retail flowers may be broadly grouped into mainly three categories: fresh-cut flowers, dried and artificial flowers, and others, including flowering pot plants. Fresh flowers occupied 87 percent of the total household expenditures on flowers. Artificial and dried flowers shared 11 percent.

There are many sub categories under each of the main categories. For example, fresh flowers included fresh-cut flowers, outdoor or garden/bedding plants and flowering and garden-house plants. Expenditures on fresh-cut flowers were further categorized into single stem, arrangements, corsages, boxed, and bouquets and bunches. Figure 3-1 shows distribution of total household expenditures on different types of fresh-cut flower products using average dollar values for 1993 through 1996.

Within the fresh-cut flowers category, arrangements accounted for 55 percent of the total dollar expenditures; single stems accounted for 17 percent; bunches and bouquets accounted for 23 percent; the remaining was 5 percent.

Household expenditures on fresh-cut flowers varied across income groups. As shown in Figure 3-2, the lowest income group with less than $25,000 accounted for 22.5 percent of the total household expenditures; the group with income between $25000 and $49,999 was 35.4 percent; those with incomes between $50,000 and $74,999 accounted for 23.5 percent; and the highest income group accounted for the remaining 18.6 percent. According the NPD data the annual average number of households who actually bought fresh-cut flowers was 39,522 for the income group with less than $25,000 annual income; 35,131 for the group with income between $25000 and $49,999; 14,810 for those with incomes between $50,000 and $74,999; and 7587 for the highest income group. Hence, the four income groups accounted for 41; 36; 15; and 8 percent of the average households buying fresh-cut flowers. It is important to note that the fourth income group with 8 percent of total households constituted 18.6 percent of the total flower expenditure. The per capita expenditure in this group, therefore, was the highest.

Flower consumption is seasonal in nature. Nearly 20 percent of the total household expenditures on fresh-cut flowers occurred during calender occasions such as Valentine's Day, Mothers' Day, Christmas, etc. (Figure 3-3). The rest occurred during non-calendar occasion such as birthdays, get well, sympathy, funeral, anniversary, and weddings.

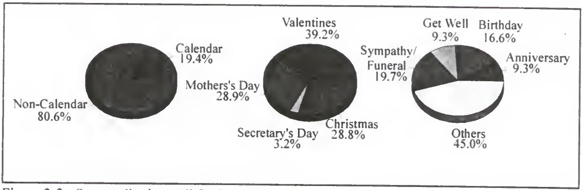


Figure 3-3: Seasonality in retail fresh-cut flower sales.

Behavioral Aspect of Flower Consumption

Fresh-cut flower products were bought for self consumption and for gifts to others. As shown Table 3-2 from 1993 to 1996 more than 87 percent of the U.S. households bought flowers for gifts to others and the remaining 12 percent bought flowers for self consumption. These numbers varied across the income group. Percentage for self consumption in the total flower expenditures was higher for households belonging to higher income groups than those belonging to lower income groups.

Reasons for buying fresh-cut flowers for gifts were expressed to be different from the reasons for buying flowers for self consumption. Table 3-3 reports the average percentage of households across income who expressed given reasons for buying flowers for self consumption. As shown in the table there were about five key reasons for buying fresh-cut flowers for self consumption constituting approximately 90 percent of the total responses. They were "caught my eyes"; "decorate my garden"; "makes me feel happy"; "treat myself"; and "others (not specified)." This pattern of response was consistent across the four income groups.

Table 3-2: Self consumption versus gifts across income group.

Income Group	Self Consumption	Gifts to Others
All	12.30%	87.70%
Under $25	12.76%	87.24%
$25/$49.9	9.85%	90.15%
$50/$74.9	12.09%	87.91%
$75 plus	16.61%	83.39%

Source: NPD group (1993-1996).

Table 3-3: Reasons for buying flowers for self (Mean percentage of households).

Reasons for buying for self	**Income Group :1 (Under $25,000)**	**Income Group :2 ($25,000 to $49,999)**	**Income Group :3 ($50,000 to $74,999)**	**Income Group :4 (Over $75,000)**
Caught my eyes	17.28	16.52	13.17	14.09
Decorate my home/garden	54.05	61.18	64.94	63.19
Entertaining at my home	1.38	1.88	2.87	4.67
Long lasting	3.09	1.75	1.89	1.79
Makes me feel happy	5.97	4.43	4.16	4.75
Reward myself	0.97	0.67	0.65	0.54
Treat myself	6.46	4.65	4.51	3.61
Other	9.91	7.91	7.16	6.42

Source: NPD Group, 1997.

Flower for gifts constituted about 90 percent of the total household expenditures on fresh-cut flowers. Table 3-4 reports the mean percentage of households across income expressing given reasons for buying fresh-cut flowers for giving gifts to others. Among fifteen different reasons behind buying flowers for gifts, only five reasons were mostly specified: "communicates feelings"; "like to give flowers"; "makes recipient feel special"; "romantic"; and "others (not specified)." These five reasons constitute more than 70 percent of the total responses across income groups.

Table 3-3 and Table 4-4 show that households' flower buying decisions were driven by a set of behavioral motives. In the following chapter a theoretical framework will depict the relationship between purchase decisions and consumer attitudes. It is likely that these behavioral aspects influenced the decisions to buy flowers from a specific type of retail outlets.

Table 3-4: Reasons for buying flowers for gift (Mean percentage of households).

Reasons for buying for gift	**Income Group :1 (Under $25,000)**	**Income Group :2 ($25,000 to $49,999)**	**Income Group :3 ($50,000 to $74,999)**	**Income Group :4 (Over $75,000)**
Colorful	5.25	4.56	3.89	4.20
Communicates feelings	10.27	12.40	12.67	12.51
Convenience	0.92	1.51	1.97	1.92
Could not think of anything	2.14	1.97	2.14	1.78
Delivery	0.70	0.81	0.84	1.34
Ideal for the person who has	4.18	4.01	3.52	3.80
Keepsake container	0.90	1.02	1.03	0.52
Like to give flowers/plants	11.99	12.85	14.65	15.58
Long lasting	4.02	3.44	3.29	3.22
Makes recipient feel special	17.69	19.41	18.68	19.70
Practical	0.92	0.94	0.99	0.97
Price	1.29	1.39	0.82	0.88
Romantic	6.17	6.83	7.32	6.59
Traditional	5.66	6.41	12.20	7.51
Other	17.09	13.50	7.16	10.18

Source: NPD Group, 1997.

Price Pattern of Fresh-Cut Flower Products

Prices of fresh-cut flower products fluctuate over time depending on the underlying demand and supply conditions. Price fluctuations of fresh-cut flower products are closely tied to the seasonal nature of the demand with much of the buying occurring on special occasions such as Valentine's Day. Apart from a number of formal occasions, there are mainly four main seasons when flowers are purchased in large quantities: Valentine's Day, Mother's Day, June (weddings), and Christmas. These high purchasing periods have considerable influence on the prices. Price fluctuations may be even higher when changes in supply conditions interact with these seasonal demand changes.

Table 3-5: Wholesale prices per unit of selected fresh-cut flower varieties, 1986-1995.

Year	Std. Carnations Cents	Mini Carnations $	Std Chrysant. Cents	Pompon Chrysant. $	Hybrid Tea Roses Cents	Sweetheart Roses Cents	Gladioli Cents
1986	15.1	1.44	35.8	1.10	35.3	24.3	15.5
1987	14.7	1.43	35.7	1.31	34.8	23.8	16.2
1988	14.5	1.51	32.9	1.27	35.3	24.3	17.0
1989	14.6	1.42	36.2	1.28	35.1	25.2	19.4
1990	15.6	1.46	39.8	1.31	34.8	26.5	20.2
1991	16.5	1.44	36.4	1.19	34.0	26.1	21.1
1992	14.4	1.51	39.3	1.16	33.9	25.2	20.0
1993	14.0	1.35	43.3	1.42	33.8	25.0	20.3
1994	15.6	1.40	47.9	1.35	33.1	23.7	20.7
1995	15.3	1.20	53.6	1.27	32.6	24.6	24.3
C.V.	4.91	6.32	16.05	7.42	2.74	3.70	13.43

Source: Agricultural Statistics, 1997.

Annual average wholesale prices for a variety of fresh-cut flowers are reported in the Table 3-5. Although there were fluctuations over the period, the prices of four out of seven reported varieties were the same or below the 1986 prices. The reported coefficients of variation (C.V.) show that price fluctuations of some varieties were higher than others. There were significant correlations among some prices. For example, the correlation between mini carnations and hybrid tea roses was -.90 at the significance level of 99 percent.

Table 3-6: Retail prices per unit of selected fresh-cut flower varieties, 1993-96.

Year	Prices	
	Roses	Carnations
1993	$1.97	$0.62
1994	$2.03	$0.65
1995	$2.33	$0.71
1996	$2.13	$0.66

Source: National Panel Diary Group (NPD).

Price patterns of selected fresh-cut flowers in the retail market were examined using retail price data for four years (Table 3-6). Annual prices were based on the NPD household consumption data by dividing the total household expenditures on selected flowers by the total quantity purchased. The average retail prices include retailers' margin and value added.

Unlike average annual prices, monthly prices of fresh-cut flowers fluctuated considerably due to increase in the purchase of flowers during the holiday periods. Figure 3-4 and 3-5 show monthly retail and wholesale prices for roses and carnations for 1993.

Average monthly wholesale prices were computed using weekly wholesale market prices for ornamental crops in Chicago. All varieties of roses and carnations were included and the highest and lowest prices for each month were used for the computation of average monthly prices. The volume of flowers sold for each variety was not considered. Monthly average retail prices were obtained by dividing total monthly NPD household expenditures by total quantity purchased. Notice that retail prices (Figure 3-4) fluctuated throughout the year with price increases particularly during the special occasions: February (Valentine's day), June (Mother's day) and December (Christmas).

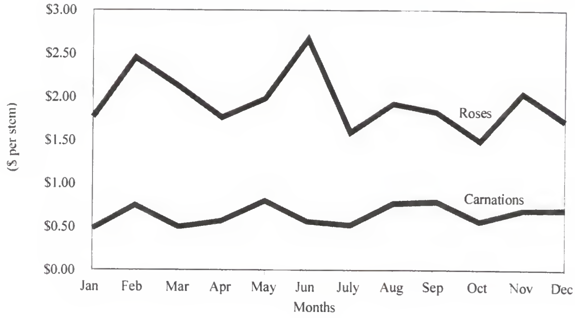


Figure 3-4: Monthly retail prices of selected fresh-cut flowers in 1993.

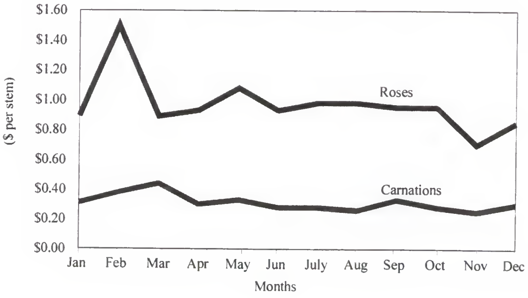


Figure 3-5: Monthly wholesale prices of selected fresh-cut flowers in 1993.

The wholesale prices (Figure 3-5) peaked in February and declined in the summer season and increased again in December.

Marketing Margins

While flowers can be priced at many points throughout the marketing channels, there are generally three exchange points where prices are most often quoted: handlers price, wholesale price, and final retail price. Price differences between these points are represented by the marketing margins.

The difference between shipping point (handlers) prices and the wholesale prices (e.g., price to florists) are the wholesale marketing margins. This includes the average shipping, handling service, and other marketing costs required to bring products to the wholesale markets. Marketing margins are frequently between 20 and 25 percent of the shipping point or handler price depending on the type of flower and the month. Movements in wholesale marketing margins follows the wholesale price pattern. The wholesale margin is highest when the wholesale price is highest (Miller, 1983). Ward (1997) assumed a markup of 1.43 at handlers level. Based on a survey of several handlers and retailers, a consensus was that handlers usually mark up their flowers by around 43 percent, therefore giving the 1.43 factor (Ward, 1997). Moving up the marketing channel, florists purchase fresh flowers and convert them into arrangements. Usually approximately 65 percent of the retail arrangement value is in flowers with the reminder being the container costs and markups. The flowers are generally marked by 3.0 to 3.5 (Ward, 1997). For example, a florist pays $1.00 for a rose and then increases price up to $3.00.

In Figure 3-6 the difference between retail and wholesale prices represents the marketing margin. As seen in the graph marketing margins in absolute terms fluctuate along with the fluctuation of retail and wholesale prices.

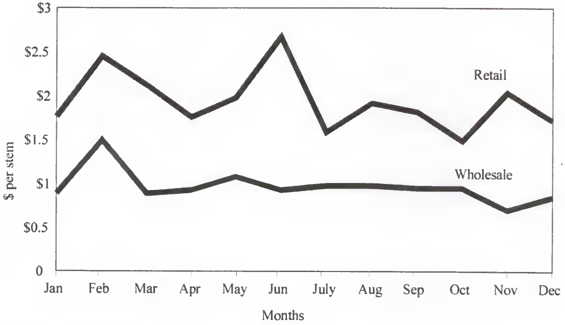


Figure 3-6: Marketing margins in fresh-cut flower industry.

Vertical Marketing Structure in Floriculture Industry

Floriculture products travel through multiple marketing channels before reaching the final consumers. Both domestic and foreign growers represent the first stage in the marketing system and their involvement in the marketing channels depends on the size of production, type of technology and sophistication in handling the crops.

Fresh-cut flowers are produced as single crops (e.g., chrysanthemums), or the multiple crops (e.g., roses and carnations). Depending on the variety, flowers are cut nearing or at the blooming stage. Handling techniques and the shipping distances are critical factors in determining when the flowers are cut. Many imported varieties are cut during the stage of buds so that products remain in good conditions along the long shipping routes. Improvements in the post harvest handling technology have introduced alternative methods of handling crops. Machine sorting and packaging versus hand sorting are one example of technological changes.

Figure 3-7 shows a generalized distribution channel applicable to most of the floriculture products. The dotted line represents functional areas within which those involved in the industry may interact when moving the products to subsequent levels in the distribution channel.

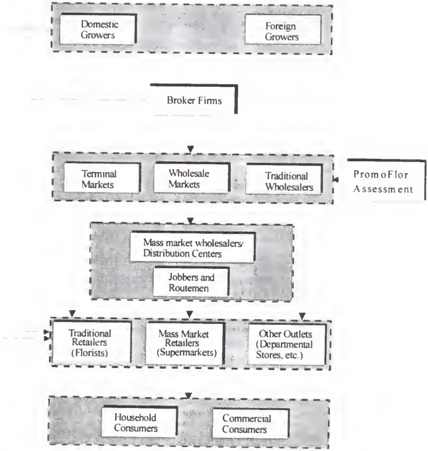


Figure 3-7: Vertical marketing structure in fresh-cut flower industry.

Size and Structure of Fresh-Cut Flower Wholesale Trade

The 1992 census of wholesale trade reported that there were 4,322 wholesale establishments of all types dealing with flowers, nursery stock, and florists' supplies. Table 3-7 further classifies the total number into functional types, namely, merchant wholesalers, producer wholesalers (manufacturers' sales branches and offices) and agents, brokers, and commission merchants. The census defines merchant wholesalers to include wholesale merchants or jobbers, drop shippers, retailer cooperative warehouses and cooperative buying associations. Agents, merchandise or commodity brokers and commission merchants are engaged in the wholesale distribution of goods for others. Agents often buy or sell merchandise for foreign or non-local firms. Brokers buy or sell on a brokerage basis but do not receive goods on consignment. Usually, commission merchants buy or sell goods which they receive on consignment.

Producer wholesalers are the large producers who sell directly to retailers or other agents (U.S. Bureau of the census, 1992 Census for of Wholesale Trade). A typical wholesaler has two main functions: credit and product handling. Wholesalers often provide credit lines to retailers for the merchandise sales. There are cases when wholesalers have provided capital loans to the growers for expansion in lieu of commitment of future supplies. The product handling function mainly involves gathering supplies, managing inventory, picking up (from growers) and delivering (to retailers), and taking care of products.

Wholesalers often help their retailer clients in the promotional activities of their products. The foremost example was the PromoFlor promotion program. Under this program the wholesalers and handlers contributed funds for the program activities.

Table 3-7: Number and size of wholesale traders by types, 1992.

	All types		Merchant Wholesalers		Grower Wholesalers		Agents, brokers	
	Number	Sales ($m)	Number	Sales ($m)	Number	Sales ($m)	Number	Sales ($m)
All establishments	3,737	6,628	3,550	5,972	15	na	172	na
Annual sales (million$):								
More than 25	16	816	10	577	1	na	5	na
10 to 24.99	75	1,137	70	na	2	na	3	na
5 to 9.99	189	1,283	167	1137	2	na	20	na
2.5 to 4.99	343	1,186	322	1109	1	na	20	na
1.0 to 2.49	862	1,362	799	1259	4	6	59	96
0.5 to 0.99	670	481	640	na	4	3	26	na
0.25 to 0.49	694	247	671	na	1	na	22	8
0.01 to 0.24	579	98	565	na	-	-	14	na
Less than 0.01	309	18	306	17	-	-	3	0.01

Source: Census of wholesale trade, 1992.
na=not available

Table 3-8: Concentration by largest wholesale trading firms, 1992.

	All types		Merchant Wholesalers		Agents, brokers and commission merchants	
	Sales ($m)	(%)	Sales ($m)	(%)	Sales ($m)	(%)
All firms	6827	100	6147	100	585	100
4 largest	436	6.4	424	6.9	165	28.2
8 largest	661	9.7	na	na	na	na
20 largest	1152	16.9	1054	17.1	324	55.4
50 largest	1874	27.5	1698	27.6	448	76.6

Source: Census of wholesale trade, 1992.
na=not available.

In 1992 4322 (Table 3-7) wholesalers accounted for $6.8 billion of wholesale trade in floral products (including non-floral products). Among the total number of wholesalers 4110 were merchant wholesalers, 18 were producer wholesalers; and 194 were agents, brokers, or commission merchants.

Table 3-7 shows that the largest number of wholesale firms had sales between $1 million and $2.5 million. Firms with the sales volume of $5 million and below accounted for 93 percent of the firms and 71 percent of the total sales of traders. Table 3-8 provides insight into the nature of concentration in the wholesale flower industry. Among firms of all types, the 20 largest firms formed 16.9 percent of the sales. For merchant wholesalers, the 20 largest firms formed 17.1 percent of the sales. In contrast, the 20 largest agent and broker firms formed 55.4 percent of the total sales in the category. Clearly concentration was higher between broker and agent wholesalers compared to the entire industry and to merchant wholesalers.

PromoFlor assessed wholesalers with more than $750,000 sales revenue. It can be inferred from Table 3-7 that more than 40 percent wholesalers were exempt from the assessment.

Size and Structure of the Retail Outlets for Fresh-Cut Flowers

Fresh-cut flowers are sold to consumers through mass merchandise; speciality stores; and others. Mass merchandise outlets include convenience stores, department stores, discount chains, drug stores, home improvements or hardware stores, and supermarkets. Supermarkets occupy the largest shares in the sale of fresh-cut flowers to households through mass merchandise. The speciality stores are florist shops, garden stores, mail catalogs, street vendors, and toll-free number services. Florist shops dominate in the speciality outlets for fresh-cut flower products. The remaining retail outlets may be grouped into other types of retail outlets. Based on market shares retail outlets for fresh-cut flower products may be categorized into three groups: florists, supermarkets, and others.

Traditionally the retail floral market has been dominated by florists who have emphasized services as a critical part of their sale. The kinds of service provided by florists include delivery, specialized catering such as weddings, custom designs, and advising. A significant part of the prices charged by florists account for the services. Therefore, there is a considerable price difference between mass marketers and florists.

Table 3-9: Reasons behind selecting a particular retail outlet by household consumers.

Reported Reasons	Florists	Supermarkets	Others
Convenience	33%	62%	50%
Delivery	8%	0%	1%
Price	8%	21%	18%
Product Quality	15%	7%	8%
Reputation	16%	1%	2%
Selection/Service	8%	3%	10%

Source: NPD group, (1993-1996).

Supermarkets provide limited services and emphasize accessibility and lower prices. Other retail outlets such as departmental stores, home improvements, convenience stores, telephone services, etc. have also emphasized accessibility and less expensiveness. Table 3-9 reports relative importance of factors such as services, image, prices, etc. in selecting the type of retail outlets. Among those households buying fresh-cut flowers from florists, only 33 percent bought because of convenience or accessibility. In contrast, 62 percent of the buyers using supermarkets selected those outlets because of convenience. The other important attribute of supermarkets and other outlets is price. In the case for florists, price was less important. As shown in Table 3-9, florists provided delivery, product quality, and reputation to their buyers.

Market Shares of Retail Outlets

Figure 3-8 shows shares of each type of retail outlets on household expenditures on fresh-cut flower products. During 1993-96, florist shops captured approximately 67.8 percent of the total retail expenditures on floral products; supermarkets shared 17.7 percent, and others shared 14.4 percent.

Table 3-10: Share of retail outlets in the household expenditures on flowers across income groups (1993-1996).

Income Group	Share of Retail Market		
	Florists	Supermarkets	Others
Under $25,000	65.4%	18.9%	15.7%
$25,000-$49,999	68.2%	19.0%	12.8%
$50,000-$74,999	73.0%	15.1%	11.8%
Above $75,000	63.6%	17.1%	19.2%

Source: NPD group (1993-1996).

Shares of retail outlets varied across income groups. As shown in Table 3-10 florists' share of the market was the highest among the three outlets in all income groups followed generally by supermarkets and other outlets. Shares of florists were higher among the middle and upper-middle income groups. The highest income group distributed more than 83 percent of their expenditures on fresh-cut flowers between florists and other outlets. Supermarkets had highest share in middle and lower income groups. Together they constituted about 40 percent of the share of supermarkets. Note that Table 3-10 shows average shares of retail outlets for four years. There were considerable fluctuations in the relative market shares of the three outlets over the four years as shown in Figure 3-9. Fluctuations were primarily during the main flower buying occasions.

Table 3-11: Number and size of retail traders, 1992.

Establishments	Number	Sales ($'000)	Percentage of Sales
All establishments	23,339	5,381.866	100.0
Annual sales ($):			
5 million to 9.99 million	11	67,681	1.2
2.5 million to 4.99 million	50	170,343	3.2
1.0 million to 2.49 million	334	462,705	8.5
500,000 to 999,999	1,427	937,814	17.4
250,000 to 499,999	4,702	1,586,505	29.5
100,000 to 249,999	10,903	1,766,448	32.8
50,000 to 99,999	4,505	344,018	6.3
Less than 50,000	1,406	47,758	1.0

Source: Census of Retail Trade, 1992.

The 1992 Census of Retail Trade (U.S. Bureau of the Census, 1993) reported that, in 1992, 27341 retail establishments sold $5.7 billion worth of floriculture products. As shown in Table 3-11, the largest number of retailers had sales between $100,000 and $250,000 and retailers with sales volume of more than $250,000 sold 60 percent of the retail sales in 1992.

Table 3-12: Concentration by largest retail trading firms, 1992.

	Number	Sales ($m)	(%)
All firms	27,341	5,719	100
4 largest	117	62	1.1
8 largest	149	97	1.7
20 largest	195	167	2.9
50 largest	302	295	5.2

Source: Census of retail trade, 1992.

The fresh-cut flower retail sector is less concentrated than the wholesale sector. Table 3-12 reports that 50 largest retailing firms sold only 5.2 percent of the total retail sales. In case of

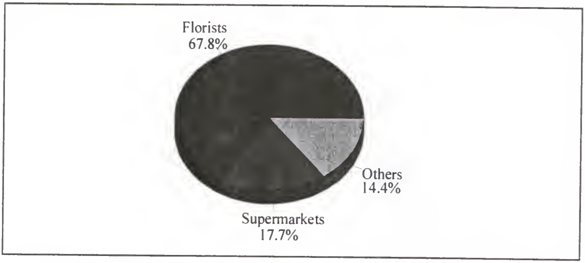


Figure 3-8: Shares of retail outlets in U.S. household expenditures on fresh-cut flowers.

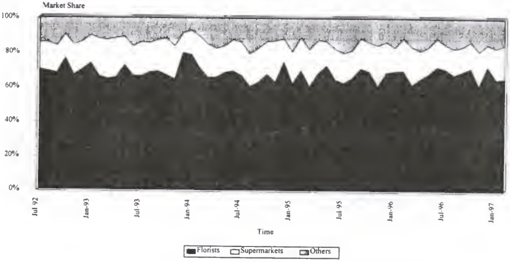


Figure 3-9: Fluctuation in market shares of retail outlets for fresh-cut flowers over time.

wholesalers, 50 largest firms sold 27.5 percent (Table 3-8) of the total wholesale volume. This shows that there are a large number of small size firms in the retail sector of floriculture industry.

Commodity Promotion Programs

Many agricultural commodities are promoted through cooperative programs known as commodity checkoff programs. These programs are funded through mandatory assessments on the producers and/or handlers of the commodities. Economic agents such as retailers who are further down in the marketing chain are usually not subject of the checkoff assessments. The assessment is usually on a per unit of sales basis either in volume or in dollar units. Firms have to meet the minimum criteria in terms of amount of sales revenue or quantity sold before being subject to the assessments. Imports are usually subject to the assessments in equivalent units to the domestic production. The role of the government in these programs, for the most part, is regulatory in nature. Participants subject to the assessment periodically vote to decide whether to continue the programs. These programs are implemented at the national, state and regional levels. Some of the well-known commodity checkoff programs include beef, milk, watermelons, eggs, flowers, citrus, and honey.

The main objective of these commodity checkoff programs is to enhance the demand for the commodities. This objective is accomplished by providing information about the commodities to the existing consumers and potential consumers through generic advertising and other promotion efforts. The information may emphasize the pre-identified positive attributes of the commodities or newly identified attributes. For example, commodities like Florida orange juice and Washington apples emphasize the health benefits of the products that may not have been perceived as part of the product attributes by some consumers. Some commodity promotion programs provide information about new usage of the existing commodities.

A substantial amount is spent on advertising for U.S. commodities through commodity checkoff programs. Recently, some of these programs have come under public criticism and legal scrutiny (Glickman v. Wileman Bros. and Elliott,Inc., 1997). Questions have been raised regarding funding mechanisms for the programs. Some of the programs including the flower promotion program have been withdrawn for unrelated reasons.

Many agricultural commodities are promoted using brand advertising. Unlike generic advertising, brand advertising emphasizes unique aspects of products, thus creating product differentiation. Floral Trans. Delivery (FTD) advertising of flowers and brand advertising of orange juice are good examples of brand advertising for agricultural products.

Promotion of Fresh-Cut Flowers and Greens: PromoFlor

A generic promotion program for fresh-cut flowers and greens commonly known as PromoFlor was implemented in late 1993 to expand the market for fresh-cut flowers and greens. This program emphasized the aesthetic value of the products through the introduction of "BuzzTM" and "Think Flowers TM" campaigns. The underlying message of the promotions was that households ought to use fresh-cut flowers as part of their everyday life. This emphasis was primarily to enhance demand for flowers through daily consumption of flowers rather than only during special buying occasions as discussed above.

The program was funded through a mandatory assessment of 0.5 percent of annual sales on handlers with annual sales of $750,000 or more. Like most other commodity programs this program also did not assess the retailers. The objective of the program was to expand the total demand for the fresh-cut flowers without significantly changing the relative market shares in terms of type of flowers and types of retail outlets used. In addition, the program's objective was to enhance the demand for flowers in the regular buying days as against the special consumption days. Therefore, the advertising messages emphasized importance of buying flowers daily.

Ward (1997) found that the PromoFlor promotion program was successful in expanding the total sales of fresh-cut flowers and greens by attracting additional buyers to the retail market and additional expenditure per buyer. However, its effect on the relative share of retail outlets was not considered. A trend analysis of the total fresh-cut flower market using annual sales figures from 1992 to 1996 shows that the market shares of the three types of retail outlets have changed over the five years. The change was more apparent during the main flower buying occasions such as Valentines Day, Mothers' Day, and Christmas. A more careful analysis is required to establish whether there has been actual change in the industrial structure of retail flower markets. Nevertheless, it may be possible that besides increasing the total demand for the flowers, the flower promotion program contributed to structural changes in the use of different retail outlets for flowers.

PromoFlor's programs were distinct from other generic promotion programs. Most generic promotion programs have emphasized the physical and benefit attributes of the products. These flower promotion programs were designed around the aesthetic value of the product and made no direct claims about different flower varieties or outlets. In contrast, brand advertising is closely linked to the services provided by retail florists.

CHAPTER 4
CONCEPTUAL AND THEORETICAL MODELS

In this chapter a conceptual model is presented to depict the role of information in consumption decisions. The model explains that products are bundles of attributes and seemingly homogeneous products may posses different sets of attributes, thus providing differentiated products. A theoretical demand and supply model is then presented to explain the role of generic advertising in enhancing industry demand. A market share model using the extension of the demand and supply model is presented to explain the scenario when generic advertising may alter market shares among the firms within the industry. Finally, theoretical models of demand systems incorporating advertising into the equation structure are presented.

Information and Consumption Decision

Product Attributes

Consumers view products and services as bundles of attributes generally defined as: physical attributes, benefit attributes and image attributes. Following Lancaster (1971), the physical attributes are those properties of products and services that are quantitative and objectively measurable. Benefit attributes are the values that consumers derive from the possession of goods or consumption of a product and consider in making choices among alternatives (Wu et al.,1989). In other words, benefit attributes describe the advantage of using a product or service, e.g., nutritious, durable, not fattening. Image attributes refer to various types of association suggested or evoked by the product (Myers and

Shocker, 1981). They usually indicate how the product itself (or use of the product) represents the user to other people. Consumers' choice of the product is influenced by the components of the attribute bundle as shown in the schematic diagram in Figure 4-1.

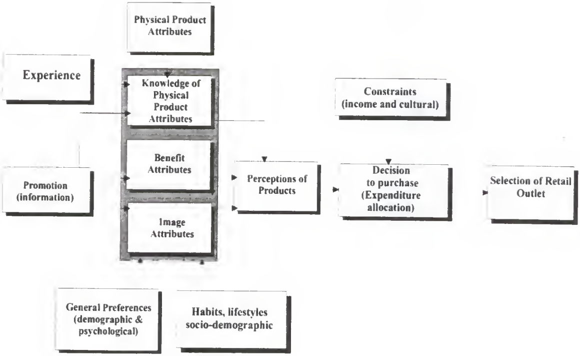

Physical Product Attributes
Experience
Knowledge of Physical Product Attributes
Constraints (income and cultural)
Benefit Attributes
Promotion (information)
Perceptions of Products
Decision to purchase (Expenditure allocation)
Selection of Retail Outlet
Image Attributes
General Preferences (demographic & psychological)
Habits, lifestyles socio-demographic

Figure 4-1: A schematic diagram showing the influence of attributes on consumer choice.

The arguments in the diagram follow the model developed by Burnswik (1952) to help explain the psychological effects on decision making. Experience and information about the products along with demographics and psychological factors influence the physical, benefit, and image attributes. Consumers' decisions regarding the allocation of total expenditure on different products and services are based on the perceptions of products and subject to income and time constraints.

Physical attributes describe the physical features of the product and services. Physical attributes are intrinsic to products and services. Benefit and image attributes, on the other hand, may comprise factors not intrinsic to products and services. Rather, they depend on who is consuming the goods. Benefit and image attributes may be affected by the elements of the marketing mix (e.g., promotion, pricing, and retailer's reputation). Physical attributes along with benefit and image attributes represent what the product is perceived to provide users. The relative importance of the three types of attributes can vary from one type of product to another as well as across consumers. Also, the benefit and image attributes are not independent of the physical attributes.

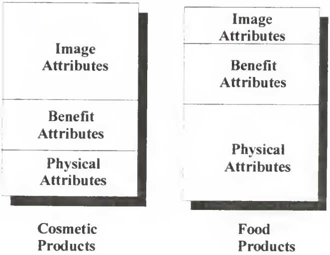


Figure 4-2: A conceptual diagram showing the attribute mix among different types of products.

Physical attributes show relatively greater importance for food and beverage products such as beef, eggs, orange juice, and vegetables. Image attributes are important in expressive types of products such as cosmetics, clothing, home decorative, and floral products. The difference in attribute mix among products may be shown using the conceptual diagram below (Figure 4-2).

The attribute mix of a product may be influenced by psychological as well as socio-demographic factors such as age, ethnic background, education, and income. For example, a cosmetic product targeted for the high-end of the market will have higher image attributes than that targeted for the middle or low end. The attribute mix of a product may also vary depending on how the product is delivered. A product delivered through mass merchandise may have lower image attributes compared to the same product delivered through specialty outlets.

The basic premise of product attribute analysis is that consumers do not derive utility from products, but rather from the attributes embodied within the products. Differences in the consumption of products actually reflect the different preference orderings for the attributes of products. Each consumer has a most preferred bundle of attributes and will purchase products that move him/her closer to the preferred bundle of attributes. Advertising functions to influence the mix of the preferred bundle of attributes so that consumers actually decide to purchase those products for which the advertising is conducted.

According to Sheth (1974) advertising influences consumers' preferred attribute bundle through four mechanisms: precipitation, persuasion, reinforcement, and reminder. Precipitation encourages consumers to experiment with goods and services and determine whether the attributes of those goods and services match the preferred bundle or not. Persuasion encourages consumers to choose a particular brand of product from among a product group. This is accomplished by influencing consumer's preference of a unique attribute, which differentiates the brand from the other brands in the product group. Reinforcement continually directs consumers' attention to the particular brand and encourages repeat purchases. Finally, the reminder encourages consumers to be aware of the general attributes of the products in the product group and to repeat purchases of any product within the group instead of a particular brand of the product within the product group.

Many seminal works in brand vs. generic advertising (Ward et al. 1985; Kinnucan et al., 1993, etc.) have indicated that in general generic advertising is intended to precipitate and remind consumers to purchase the largely undifferentiated products.

Role of Advertising

In the model of purchase decision shown in Figure 4-1, preferences and constraints influence choice. Preferences are considered endogenous being shaped by consumer perceptions of product characteristics (Brunswick, 1952). Perceptions are moderated by psychological cues defined to include marketing influences such as product design, packaging, and promotion and advertising (Hauser and P. Simmie, 1981). However, marketing programs designed to influence perceptions of a product have to be able to manipulate the attribute mix of a product. Thus, product or commodity advertising can influence the consumption decision of the households through its impact on the attribute mix.

Advertising affects the demand for a commodity. However, there are two important issues to be addressed with regard to generic advertising programs. First, does generic advertising impact the demand for a commodity leading to changes in the industry revenue? Second, does generic advertising influence the demand for differentiated products such as fresh-cut flowers purchased through florists versus fresh-cut flowers bought in supermarkets such that market shares are changed?

The first issue is related to a generic advertising program when the commodity in question is truly homogeneous and cooperative. While the magnitude of the advertising impact will differ across commodities and programs, a general scenario can be presented using a diagram developed by Ward (1997). Define demand for a commodity as D=D(p,a,y) and supply as S=S(w) for a very short period and S=S(p,w) for relatively long period. *p* represents the price of a commodity, *a* represents advertising expenditures, *y* is consumer income, and *w* represents input costs per unit. For a given set of market conditions and no advertising, one would expect the demand for the product to be D_1 as shown Figure 4-3.

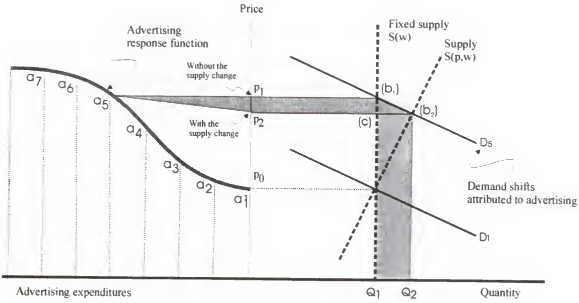


Figure 4-3: Industry Demand changes and the advertising response curve (source: Ward, 1997).

Now let advertising expenditures increase in equal increments as suggested with the left part of the Figure 4-3. An increase from a_1 to a_5 produces an upward demand shift to D_5. With supply curve *s*(w) price increases from p_0 to p_1 and with supply curve *s*(p,w) this increase is only to p_2. The difference between p_1 and p_2 is due to the supply increase in response to the price change from p_0 At the pre-advertising level, industry revenues stood at $p_0 Q_1$ while with the fixed supply revenues increased to $p_1 Q_1$ or a gain of $(p_1-p_0)Q_1$. This gain must be compared with the additional advertising cost corresponding to a_5. Also, even with supply response producing a lower price p_2, revenues are greater by $p_2 Q_2 - p_0 Q_1$. Clearly the final gains depend on the advertising response curve and the supply and demand slopes.

Generic Advertising and Market Shares

The second issue relates to the impact of generic advertising on market shares. Are there shifts in the market shares among the products differentiated in terms of their attributes such as services and images associated with outlets? Shifts in market shares can be illustrated expanding in Figure 4-3 as presented in Figure 4-4.

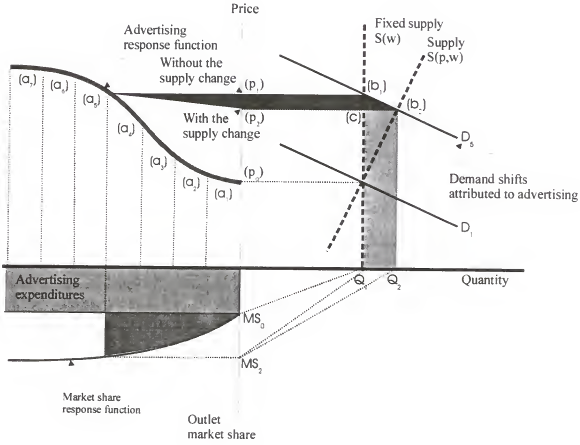


Figure 4-4: Market share changes and the advertising response curve (source: Ward, 1997).

In the lower coordinate in Figure 4-4, market shares are shown for a differentiated product such as flowers purchased through florists. With no brand advertising florists have MS_0 share of the fresh-cut flower market. If the generic advertising is outlet neutral then the market share of florists should remain fixed as suggested with the horizontal line (MS_0) immediately under the advertising expenditures. Even with the supply response indicated with S(p,w) the florists share still maintains the same.

Now assume that the generic advertising of fresh-cut flowers is not outlet neutral. It means PromoFlor has directly as well as indirectly reinforced some of the differentiating attributes of the products sold at different outlets (i.e., services and images associated with florists or convenience associated with supermarkets, etc.). In Figure 4-4, PromoFlor has expanded total demand as shown before with the shift in demand from D_1 to D_5 . Furthermore, the share of florists has increased from MS_0 to MS_2 in the case illustrated. With a vertical supply total industry revenue increase by $(p_1 - p_0)Q_1$ Furthermore, florists realize an increasing share of the total gain with the amount $(p_1\ MS_2 - p_0\ MS_0)\ Q_1$. If supply also increase, then the florists gains are $(p_0 + \Delta p)\ (Q_1 + \Delta Q)\ (MS_0 + \Delta\ MS\ ) - (p_0\ Q_1\ MS_0)$.

Since from Figure 4-3 and 4-4, $\Delta p \geq 0$ and $\Delta Q \geq 0$ then if $\Delta MS \geq 0$ the florists gain a disproportionate share of the market with the generic advertising. At issue from an equity perspective is the relationship between the generic promotions and MS_i. Is the market share response curve is flat (horizontal), rising, or falling? Theoretically one would hypothesize the share curve to be flat. If it is bias in favor of the outlet represented with MS_i, the generic promotions benefit the florists over other outlets. In contrast, if the share curve declines, the generic advertising is bias against the florists. The market share response is drawn with an upper limit to the market share gains as must always be the case since the maximum share is one.

Clearly, the discussion has been put in the context of florists' share of the fresh-cut flower market. One could have equally expressed the shares in terms of supermarkets or other outlets.

The above discussions focused on impacts of generic advertising on the general demand for the products and on the market share of the firms selling the products. While generic advertising programs are implemented, producers of brand products simultaneously implement brand advertising to maintain or increase their market share. Figure 4-5 explains the theoretical aspects of brand advertising.

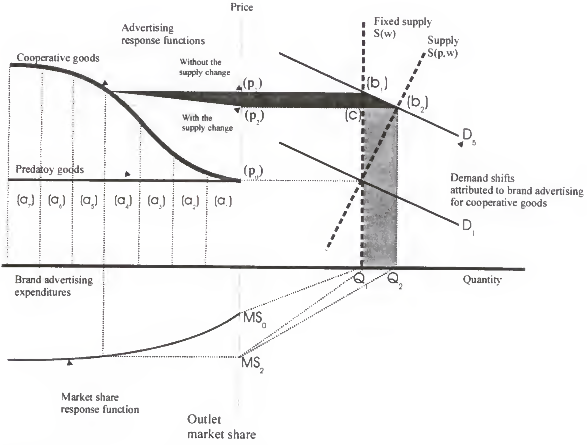

Price
Advertising response functions
Cooperative goods
Without the supply change
(p1)
With the supply change
(p2)
Predatoy goods
(p0)
(a7)
(a6)
(a5)
(a4)
(a3)
(a2)
(a1)
Fixed supply S(w)
Supply S(p,w)
(b1)
(b2)
(c)
D5
Demand shifts attributed to brand advertising for cooperative goods
D1
Q1
Q2
Quantity
Brand advertising expenditures
MS0
MS2
Market share response function
Outlet market share

Figure 4-5: Market share changes and brand advertising response curves.

In earlier sections two types of goods for which brand advertising may be implemented, namely predatory and cooperative goods, were described. In case of predatory goods the impact is purely on the market share as shown in Figure 4-5 with the horizontal promotion response function. As the expenditure level increases to a_3 the market share of the advertised brand increases to MS_2 without any impact on the general demand for the product. So, at each level of brand advertising expenditure the total quantity demanded remains at Q_1. The advertised brand's market share of the industry revenue indicated by $p_0 Q_1$ continues to increase up to the limit imposed by the total market. The advertising brand realizes an increasing share of the total gain with the amount ($p_0 MS_2 - p_0 MS_0$). In case of cooperative goods, however, the brand advertising may have an impact on both market demand and advertised brand's market share. In Figure 4-5, at level a_5 of brand advertising expenditures, market demand for cooperative goods shifts to D_2 and market price increases to p_1 if supply is assumed to be fixed and p_2 if supply is assumed to be flexible. At the same time the advertised brand's market share on the new industry revenue indicated by $p_1 Q_1$ or $p_2 Q_2$ increases to MS_2. With a vertical supply curve, total industry revenue increases by $(p_1 - p_0) Q_1$. Furthermore, the advertised brand realizes an increasing share of the total gain with the amount $(p_1 MS_2 - p_0 MS_0) Q_1$. If supply also increases, then the gains are $(p_0 + \Delta p)(Q_1 + \Delta Q)(MS_0 + \Delta MS) - (p_0 Q_1 MS_0)$.

Theoretical Framework

In Chapter 2 two approaches to incorporating advertising variables in demand systems were discussed. In the first approach advertising is directly included in the utility function through scaling and/or translating. The second approach is based on the household production theory. Under this approach a consumer's utility is function of characteristics of products rather than products themselves. A consumer combines market goods, time, capital including knowledge through advertising in producing nonmarket goods that it consumes to obtain desired utility level. The key to the household production theory is some kind of transformation that takes place from the time consumers buy market goods to the time they actually consume them. In many goods, for example food items, such transformation is guaranteed. In case of fresh-cut flowers transformation may or may not occur. This approach to incorporating advertising is not considered appropriate. Therefore, a system of demand equations is derived by incorporating advertising directly into the utility function.

Consumer Utility and Advertising

A consumer's choice problem, when advertising affects utility function directly can be expressed as:

(4.1) $$\text{maximize} \quad u=u(q,a)$$

subject to a budget constraint: $p'q = \mu$

where q is a vector of market goods, $q = (q_1, \ldots\ldots, q_n)$; p is a price vector $p=(p_1, \ldots\ldots\ldots, p_n)$; a is a vector for advertising levels, $a = (a_1, \ldots\ldots, a_n)$; and μ is total expenditures.

The demand equation obtained by solving (4.1) has the form

(4.2) $$q_i = f_i(p,a,\mu)$$

By substituting q_i into the direct utility function we obtain indirect utility function and cost function:

(4.3) $$u=\Phi(p,a,\mu)$$

(4.4) $$\mu= \mu(p,a,u)$$

Equation (4.2) can be derived directly from (4.3) and (4.4) using Roy's identity and Shepherd Lemma:

(4.5) $$q_i=\frac{\partial\Phi}{\partial p}/\frac{\partial\Phi}{\partial\mu}$$

The basic requirement for a demand system incorporating variables like advertising is that the increase in demand of one of the products due to advertising must be offset by decrease in demand of others. Since, we are reallocating fixed expenditures on good *g* among its elements, the effect of *a* on the total expenditures is already considered. Following Brown and Lee (1993) this constraint can be expressed as differentiation of budget constraint with respect to advertising levels, a_i, that is:

$$\frac{\partial\mu}{\partial p_i} = h_i(p,a,\mu) = h(p,a,\Phi(p,a,\mu) = q_i \tag{4.6}$$

$$\sum_j p_j[\frac{\partial q_j}{\partial a_i}] = 0 \tag{4.7}$$

$$\sum w_j x_{ji} = 0 \tag{4.8}$$

where $w_j = \frac{p_j q_j}{\mu}$ and $x_{ji} = (\frac{\partial q_j}{\partial a_i}) * (\frac{a_i}{q_j})$ or the elasticities of the different products with respect to advertising.

Market Share and Demand Systems

Market share changes among retail outlets for fresh-cut flowers can be appropriately evaluated using one or more of the popular share models that are based on linear expenditure systems. There are mainly three types of share models that are flexible and consistent with demand theory: Translog (Christensen, Jorgenson, and Lau; Jorgenson, and Lau), Rotterdam model

(Theil.1965. 1976; Barten. 1977). and AIDS (almost ideal demand system) model (Deaton and Muellbaur, 1980).

Translog model

Formally a translog cost function incorporating advertising can be written as:

$$\ln C=\alpha_0+\sum_i^n \alpha_i \ln p_i+\sum_j^n \beta_j \ln a_j+1/2\sum_i^n\sum_j^n \alpha_{ij} \ln p_i \ln p_j +1/2\sum_i^n\sum_j^n \beta_{ij} \ln a_i \ln a_j+1/2\sum_i^n\sum_i^n \varphi_{ij} \ln p_i \ln a_j \tag{4.9}$$

The number of parameters to be estimated can be reduced by imposing theoretically derived restrictions. The symmetry condition is $\alpha_{ij} = \alpha_{ji}$. The linear homogeniety conditions are $\Sigma\alpha_i = 1$; $\Sigma_j\alpha_{ij} = 0$ for all i; $\Sigma\varphi_{ij} = o$ for all j; and $\beta_{ij} = \beta_{ji}$. Budget share equation can be derived by differentiating (4.9) with respect to price and applying Shepherd's Lemma:

$$\partial \ln C/\partial p_i = w_i = \alpha_i+\sum_j \alpha_{ij} \ln p_j+\sum_j \varphi_{ij} \ln a_j \quad i=1,\ldots,n \tag{4.10}$$

where $w_i = p_i q_i / C$ and is outlet *i's* share of total expenditures on fresh-cut flowers. The φ_{ij} parameters show the effect of advertising levels on the shares of each retail outlet.

Rotterdam model

Following Brown and Lee (1997), the Rotterdam model incorporating advertising can be written as:

$$w_i \; d(\log q_i)=\theta_i \; d(\log Q)+\sum_j \pi_{ij} \; d(\log p_j)+\sum_j \beta_{ij} \; d(a_j) \tag{4.11}$$

where $w_i = p_i q_i / x$ is the share for firm *i*; $\theta_i = p_i\,(\partial q_i/\partial x)$ is the marginal propensity to consume; $d(\log Q) = \Sigma w_i\, d(\log q_i)$ is the Divisia volume index; $\pi_{ij} = (p_i p_j/x)*s_{ij}$ is the Slutsky coefficient, with $s_{ij} =$

$(\partial q_i/\partial p_j + q_j \ \partial q_i/\partial x)$ or the element in the *ith* and *jth* column of the substitution matrix S: $\beta_{ij} = w_i$ $(\partial q_i/\partial a_j)$ are advertising coefficients, respectively.

Under both of the above models observations are transformed into logarithmic form. In case of the Translog model the observations are transformed into log form, while that in the Rotterdam model the difference between observations in two time periods is transformed into log form. Note that a log transformation of a zero observation results into a negative number. Therefore, it is imperative that for both the models there exist positive observations for all data points.

Both the Tranlog (4.10) and the Rotterdam (4.11) share equations will ensue potential problems in empirical part of the study due to the type of data for the promotion. Since PromoFlor was implemented only for a short period, there were many weeks with no promotional expenditures.

Almost Ideal Demand Systems (AIDS) model

The AIDS model as suggested by Deaton and Muelbaur (1980) has been used extensively across many products. Denoting the price of the ith good at time t by p_{it}, the column vector of prices by p_t and utility by u_t, the expenditure function for the AIDS model is written as:

$$\ln c(u_t,p_t)=\alpha_0+\sum_k \alpha_i \ \ln p_{kt}+1/2\sum_k \sum_j \pi^*_{kj} \ \ln p_{kt} \ \ln p_{jt}+u_t \ \beta_0 \ \Pi_k \ p_{kt}^{\beta_k} \tag{4.12}$$

$$w_{it}=\alpha_i+\sum_j \pi_{ij} \ln p_{jt}+\beta_i \ \ln \ (\mu_{it}/P_t) \tag{4.13}$$

Budget share equation can be derived by differentiating (4.12) with respect to price and by applying Shepherd's Lemma. Denoting the budget share for the i_{th} outlet by w_{it} and total expenditures in the i^{th} outlet by x^{it}, the share function can be written in deterministic form as:

$$\ln P_t = \alpha_0 + \sum_k \alpha_k \ln p_{kt} + 1/2 \sum_k \sum_j \pi_{kj} \ln p_{kt} \ln p_{jt} \qquad (4.14)$$

where $\pi^*_{ij} = 1/2(\pi_{ij} + \pi_{ji})$ and P_t is essentially a price index

Applying the regularity conditions implied by the budget constraint and utility maximization to (4.13) the following demand conditions are obtained:

ADDING UP: $\Sigma_k \alpha_k = 1, \Sigma_k \beta_k = 0 \text{ and } \Sigma_k \pi_k = 0 \ \forall k$

HOMOGENEITY: $\Sigma_j \pi_{ij} = 0 \ \forall i$

SYMMETRY: $\pi_{ij} = \pi_{ji} \ \forall i$

NEGATIVITY: The matrices K_t are negative semi-definite with elements

$$K_{t\,ij} = \pi_{ij} + \beta_i \beta_j \ln(\mu_t/P_t) - \delta_{ij} w_{it} + w_{it} w_{jt}$$

Note that δ_{ij} is Kronecker's delta, equal to one when $i=j$ and zero elsewhere.

Scaling and Translating in Demand Systems

Demand systems incorporating an advertising often treat the advertising as preference or quality shifters (Brown and Lee, 1993). This approach of incorporating advertising is also known as scaling and translating. In the context of market goods, advertising generates price and/or income effect. Brown and Lee (1993), and Duffy (1995) provide an extensive treatment of scaling and translating by incorporating advertising into the direct utility function.

Scaling

Advertising is assumed to be persuasive apart from being informative (Ward, 1997). Persuasive advertising is defined to be that which can alter tastes even without changing actual characteristics of products. Fisher and Shell (1969) called it "good-augmenting" effects of advertising. Following the scaling approach discussed by Brown and Lee (1993), the impact of advertising can be incorporated into the direct utility function with a multiplicative scaling factor:

(4.15) $$\text{maximize } u=u(q^*)$$

$$\text{subject to } p^{*\prime}q^* =\mu$$

where $q^* = (q_1^*, \ldots\ldots, q_n^*)$, $q_i^*= b_i q_i$; $p^*=(p_1^*, \ldots\ldots\ldots, p_n)$, $p_i^* = p_i/b_i$; and $b_i(a)$. In (4.15), b_i is the scaling parameters and depends on the level of advertising, a; q_i^* is an adjusted or perceived quantity following from the product of scaling parameter and actual quantity, q_i; p_i^* is the perceived price, the market price divided by the scaling parameter b_i. The maximization procedure from (4.15) yields the following demand equations

(4.16) $$q_i^* = q_i^*(p^*, \mu) \qquad \text{or}$$

(4.17) $$q_i = 1/b_i \; q_i^*(p^*, \mu)$$

and the following indirect utility and cost functions

(4.18) $$u = \Phi(p^*, \mu) \quad \text{and}$$

(4.19) $$\mu = c(p^*, u)$$

Brown and Lee (1993), and Duffy (1995) apply the above concept of scaling in the AIDS model. They obtain the following share equation from the scaling adjusted cost function:

(4.20) $$w_i=\alpha_i+\sum_j \ln[\frac{p_j}{b_j}]+\beta_i \ln[\frac{\mu_i}{P^*}]$$

(4.21) $$P^*=\alpha_0+\sum_j \alpha_j \ln[\frac{p_j}{b_j}]+1/2\sum_j \sum_k \pi_{jk} \ln[\frac{p_j}{b_j}]\ln[\frac{p_k}{b_k}]$$

Translating

An alternative approach to incorporating impact of the advertising is suggested by Pollak and Wales (1981) and adopted by Green (1985), Blancifort and Green (1983), Duffy M. (1995) and

Piggott et al (1996). Under this approach advertising effectively shifts up the subsistence level of consumption of advertised products. Pollak and Wales (1992) interpreted demographic translation as "necessary" or "subsistence" parameters of demand system to depend on demographic variables. Similar interpretation can be made regarding advertising variables.

Following Brown and Lee (1993), a consumer choice problem with the adjustment using translation approach can be written as:

(4.22) $$\text{maximize } u=u(q^*)$$

$$\text{subject to } p'q^* = \mu^*$$

where q_i^* is defined as $q_i^* = q_i - \delta_i$; $\mu^* = \mu - \Sigma\ p_j \delta_j$; and $\delta_i = \delta_i(a)$, the translation parameter for product i through which advertising is introduced. The term μ^* is referred as supernumerary income in the context of the linear expenditure system and is available after the fixed expenditure $\Sigma\ p_j \delta_i$ is met.

The maximization of (4.22) yields the following forms of the demand equation, indirect utility function, and cost function:

(4.23) $$q_i = \delta_i + q_i^*(p, \mu^*)$$

(4.24) $$u = \Phi(p, \mu^*) \quad \text{and}$$

(4.25) $$\mu = \Sigma\ p_j \delta_j + c(p, u)$$

From the AIDS specification with translation the following share equation is derived:

(4.26) $$w_i = \frac{p_i\delta_i}{\mu} + \Phi\left[\frac{\mu - \sum_j p_j\delta_j}{\mu}\right]$$

$$\textit{where} \quad \Phi = \alpha_i + \sum_j \pi_{ij} \ln p_j + \beta_i \ln\left[\frac{\mu_i}{P}\right]$$

$$\textit{where} \quad P = \alpha_0 + \sum_j \alpha_j \ln p_j + 1/2 \sum_j \sum_k \pi_{jk} \ln p_j \ln p_k$$

Duffy (1995) derived and estimated an alternative version of advertising translation in the AIDS model. Similar specification incorporating advertising translation was also estimated by Green et al (1991); Piggott et al (1996); and Rickertsen et al (1995). The following AIDS model incorporating translation was derived and estimated by Duffy (1995).

$$w_i = \alpha_i + \sum_j \lambda_{ij} \ln a_j + \sum_j \pi_{ij} \ln p_j + \beta_i \ln \left| \frac{\mu_i}{P} \right| \tag{4.27}$$

$$\textit{where} \quad P = \alpha_0 + \sum_k \alpha_k \ln p_k + \sum_k \sum_j \lambda_{kj} \ln p_k \ln a_j + 1/2 \sum_j \sum_k \pi_{jk} \ln p_j \ln p_k$$

The model implies that advertising induces changes in the current period budget shares by increasing the subsistence level of consumption.

Conditional Demand Equations

Usually demand systems are developed for a particular group of commodities without losing theoretical consistency. This approach is important because addressing a full system of household expenditure allocations is complicated. Also, data for all commodity groups consumed by households are often not available. Therefore, under certain assumptions analyzing subsystems of goods, which are derived from full-system of demand model is theoretically plausible. Assumption of separability and additivity of the utility function allows such subsystem analysis. Separability means that goods fall naturally into groups so that there is more independence in some forms of decision making than others. For example, consumer expenditure decisions about food items are independent of decisions about clothing. Therefore, groups of goods are not substitutable but within the groups individual goods may be substitutes and complements of each other. The utility function is assumed to be additive meaning that the total utility is the sum of utility derived from each separate groups of goods. The notion of additivity and separability can be extended to many groups and subgroups of goods. For example, in this study we assume that flowers belong to the group of goods associated with giving and receiving gifts. Apart from flowers, there are many other types of gifts such as jewelry, perfumes, cloths, etc. These types of gifts may be defined as separable subgroups of goods. In each subgroup there are many individual goods. Within the flower group, the individual goods are flowers sold through different outlets. For example, in the fresh-cut flower subgroups individual goods are arrangements sold at supermarkets, arrangements sold at florists, and arrangements sold at other stores. Each individual goods are differentiated products. Such differentiations are attributed to services provided by the type of retail outlet as well as reputation of outlets. The data used in the study is an exhaustive set, which includes household expenditures on all types of fresh-cut flowers sold through all types of retail outlets.

CHAPTER 5
EXPENDITURES ALLOCATION MODELS

This chapter includes the expenditures allocation models based on the theoretical models developed in Chapter 4. Equations for estimating elasticities including advertising elasticities are formulated. All econometric properties of the models including error distribution and estimation techniques are explained.

Advertising and Expenditures Allocation Models

In Chapter 4 two different approaches to incorporating advertising into the demand models were discussed: household production model and direct incorporation of advertising in consumer utility function. Consumption of cut flowers at the household level may or may not require transformation of market goods into nonmarket goods that consumers ultimately use. Although, the transformation is feasible since the flowers may be purchased to make arrangements or for similar uses. Thus, the household production approach to incorporating advertising of flowers was less appropriate. The approach, which directly incorporates the advertising variable in the utility function is more suitable. Among three different demand system models that have been widely used, the AIDS model is most practical given the constraints imposed by the data. Earlier, two methods incorporating advertising in the AIDS models were discussed, namely scaling and translating. The model specifications using scaling technique required log conversion of the advertising data. PromoFlor was implemented only for short period, therefore, there were many zero observations for the generic advertising variable. Since, log of zero is an undefined number, the only way to estimate the model was by discarding a large number of observations. Alternatively, one could arbitrarily assume small positive value to replace the zero observation. The translating technique, however, does not pose such constraints. Equation (4.26) was one form of model specification using translating technique. In the present form the model is highly nonlinear in the parameters, thus creating difficulties in terms of achieving solutions. The alternative specifications were equations (4.27). This form of the AIDS model with advertising translation, although nonlinear in the parameters, was more tractable and provided ready solutions. Expenditure allocation models follow below based on equations (4.27) from Chapter 4.

Budget Shares in AIDS Model

The almost ideal demand system (AIDS) in share form including advertising effects is given by:

$$w_{it} = \alpha_i + \sum_{j=1}^{3} \Theta_{ijt} + \sum_{k=1}^{3} \gamma_{kj} \ln p_{kt} + \beta_i (\ln \mu_t - \ln P_t), \qquad \forall\ i,j = 1,2,3 \tag{5.1}$$

$$\ln P_t = \sum_{k=1}^{3} (\alpha_k + \Theta_{kj}) \ln p_{kt} + 1/2 \sum_{k=1}^{3} \sum_{j=1}^{3} \gamma_{kj} \ln p_{kt} \ln p_{jt} \tag{5.2}$$

where w_{it} represents the i^{th} budget share with 1=florists, 2=supermarkets and 3=other outlets. Θ_{ijt} includes all the demographic variables along with generic and brand advertising. The elements of Θ_{ijt} are given in the following equations. P_i are prices and μ is total expenditures. In addition, $\Sigma\beta_i = 0$ and $\Sigma\gamma_{ij} = 0$. Each γ_{ij} represents the change in the i^{th} budget share with respect to a percentage change in the jth price with real expenditures held constant. Each β_i represents the change in the ith budget share with respect to a percentage change in the real income or expenditures with prices held constant.

Advertising effects were introduced as shown in equation (5.3). Square roots of both the generic and brand variables were used with the assumption that the impacts of both types of advertising increase at a decreasing rate. The theoretical motivation behind this form of advertising variables was explained in chapter 4. Often advertising efforts are found to have lag impacts. Many studies of advertising effects have included parameters for these lagged effect showing the influence of past advertising expenditures (Blanciforti et al. 1985). In case of PromoFlor such effects may not have occurred given that the program existed for a short period. Given the limited data set, PF_t and OA_t in equation (5.3) are for the current level of advertising expenditures only.

$$\Theta_{i1t} = \lambda_{1i} PF_t^{0.5} + \lambda_{2i} OA_t^{0.5} \tag{5.3}$$

where PF=PrmoFlor expenditures; OA=brand advertising expenditures; $\Sigma\lambda_{1i} = 0$; and $\Sigma\lambda_{2i} = 0$.

In addition to the advertising, two more demographic variables were introduced in the model, namely seasonal consumption dummies and attitude variables. In Chapter 3 seasonality in consumption of fresh-cut flowers was grouped into three categories: special calender occasions such as Valentines day, mothers day and Christmas; other calender occasion such as secretary's day, boss's day, etc.; and other days including wedding. Equation (5.4) expresses the consumption pattern using two dummies, D_1 and D_2:

$$\Theta_{i2t} = \tau_{1i} D_{1t} + \tau_{2i} D_{2t} \tag{5.4}$$

where D_1 represents consumption during special calender occasions and D_2 represents consumption during other calender occasions. Also, $\Sigma\tau_{1i} = 0$; $\Sigma\tau_{2i} = 0$.

As discussed in Chapter 3, flowers are bought either for self use or for gifts to others. Consumers have expressed several reasons for buying for self or for others. These attitude variables may have an impact on the selection of retail outlets selected. Equation (5.5) includes the two attitude variables for each purchase decision: purchase for self and purchase for others:

$$\Theta_{i3t} = \varepsilon_{1t}\ SLF_{1t} + \varepsilon_{2t}\ SLF_{2t} + \varepsilon_{3t}\ GFT_{1t} + \varepsilon_{4t}\ GFT_{2t} \tag{5.5}$$

with SLF1= the first principal component representing the reasons behind purchasing flowers for self; SLF2=the second principal component for the reasons behind purchasing flowers for self; GFT1= the first principle component representing reasons behind purchasing flowers for gifts; SLF2=the second principal component representing the reasons behind purchasing flowers for gifts. Also, $\Sigma\varepsilon_{1i} = 0$; $\Sigma\varepsilon_{2i} = 0$; $\Sigma\varepsilon_{3i} = 0$; $\Sigma\varepsilon_{4i} = 0$.

All models were estimated in two levels. In the first level, the systems of demand equations for each type of fresh-cut flowers for four income groups were estimated independently with the assumptions that the error terms of each of the equations were related within the income group only. In the next level, the assumption regarding independence of individual income groups was lifted and a system of demand equations within the income group as well as across the income group was estimated.

Models were estimated for overall fresh-cut flowers and for three specific types of fresh-cut flowers: arrangements, single stems, and bouquets/bunches/corsages. In addition models were estimated for the total U.S. and then across four U.S. regions: East, Central, South, and West. Since the focus of the study is on overall fresh-cut flowers, discussions are largely based on results for overall fresh-cut flowers. Tables and figures for the results relating to the three types of fresh-cut flowers and the four U.S. regions are included in the appendices.

Demand Elasticities

An elasticity is a measure of the sensitivity of one variable to another. Specifically, it is a number that tells us the percentage change that will occur in one variable in response to a one percent change in another. For example, price elasticity of demand measures the sensitivity of quantity demanded to price changes. It tells us what the percentage change in the quantity demanded for a good

will be following a one percent increase (or decrease) in the price of that good. There are several types of elasticity measures that explain the economic nature of the goods and their relationship with other goods. Three key elasticities are: own price elasticity, cross price elasticity, and expenditure elasticity. Own price elasticity measures the relationship between the price of a good and its quantity demanded, while cross price elasticity measures the relationship between two goods which may be related to each other. Income elasticity measures the relationship between consumers' income and demand for the goods.

Although the main objective of the study is to evaluate the impact of advertising on market shares of retail outlets, it is critical that the key elasticities are estimated and discussed. Before discussing advertising impacts it is imperative that the estimated parameters and elasticities are consistent with the economic theory. Discussing advertising effects is fruitless if the goods in question do not follow basic economic rules. Price, income, market share, and promotion elasticities are computed using the derivations shown in Appendix A.

Compensated, Uncompensated Price Elasticities and Income Elasticities

Duality theory explains consumers` optimization problems in two ways: utility maximizing allocation on different goods given the constraint posed by incomes or cost minimizing allocation on different goods for a given utility level. These two problems are often described as dual problems, and may be expressed as:

Original Problem:

(5.6) $\max u=v(x)$; subject to $p`x=m$

Dual Problem:

(5.7) $\min m=p`x$; subject to $v(x)=u$

where, u is the direct utility function, x is a set of goods, p is a price vector, and m is consumers` income. The solution from (5.6) is the set of Marshallian or uncompensated demand functions, x(m,p) while the solutions from (5.7) are Hicksian or compensated demand functions, x(p,u). In the first problem the solutions are derived in terms of price and income, while in the second problems the solutions are derived in terms of price and given utility. When price of a commodity changes the real income of a consumer changes. Compensated demand takes that into account and measures the change in quantity demand by keeping real income at the same level though compensation. Hence, compensated demand elasticity offers true measure of relationship between price and quantity demanded. The following are the formulae used in calculating various demand elasticities (see Appendix A for the derivations):

a) Own price uncompensated elasticity:

(5.8) $$\varepsilon_{ij}=(\gamma_{ij}-\beta_i\Phi_i)/w_i-1 \quad \forall i=j$$

b) Cross price uncompensated elasticity:

(5.9) $$\varepsilon_{ij}=(\gamma_{ij}-\beta_i\Phi_i)/w_i-0 \quad \forall i\neq j$$

where $\Phi_i=\alpha_i+\Theta_{ijt}+\sum_j \gamma_{ij} \ln p_i$

c) Compensated demand elasticity

(5.10) $$\varepsilon^{*}_{ij}=\varepsilon_{ij}+w_j\eta_i$$

In the above price elasticities, effects of promotion variables enter through Θ.

d) Income elasticity

(5.11) $$\eta_i=1+(\beta_1/w_i)$$

Share Elasticities

While demand elasticities help understand economic characteristics of fresh-cut flowers sold through different outlets, share elasticities provide us measure of relationship between market shares and the exogenous variables like price, income, and promotion expenditures. The following are the share elasticities used in the analysis:

a) Share elasticity with respect to price

(5.12) $$\delta_{ij}=(\gamma_{ij}-\beta_j\Phi_i)/w_i$$

b) Share elasticity with respect to income:

(5.13) $$\eta_i^w = \beta_i / w_i$$

PromoFlor and Brand Advertising Elasticities

Effect of generic as well as brand advertising on market shares of retail outlets of fresh-cut flowers can be measured using advertising elasticities. However, one has to be careful in drawing conclusions about the magnitude of the effects of promotions based on elasticities alone. Elasticities report the magnitude of effects on a percentage basis, yet the same may not translate into meaningful dollar amounts.

PromoFlor elasticity reports the magnitude of the impact of PromoFlor on the market shares of retail outlets. PromoFlor market share elasticity is defined as $(\partial w_i/\partial PF)*(PF/w_i)$. The following derivation is for the PromoFlor elasticity:

(5.14) $$\frac{\partial w_i}{\partial PF} = \frac{0.5\ \lambda_{1i}\ -\ 0.5\ \beta_i \sum_{j=1}^{3} \lambda_{1j} \ln p_j}{PF^{0.5}}$$

(5.15) $$\frac{\partial w_i}{\partial PF}\frac{PF}{w_i} = \left(\frac{0.5\ \lambda_{1i}\ -\ 0.5\ \beta_i \sum_{j=1}^{3} \lambda_{1j} \ln p_j}{PF^{0.5}}\right)\left(\frac{PF}{w_i}\right)$$

(5.16) $$\xi_i^P = (0.5\ \lambda_{1i}\ -\ 0.5\ \beta_i \sum_{j=1}^{3} \lambda_{1j}\ \ln p_j) * (PF^{0.5}/w_i)$$

where λ_1 is the estimated coefficient for PromoFlor, β_i is the expenditure effect, *ln p* is the log of price of cut flowers at retail outlet *i*, *PF* is PromoFlor's expenditures on generic promotions, and w_i is the market share of retail outlet *i*.

Similarly, brand advertising elasticity is:

$$\xi_i^a = (0.5\ \lambda_{2i} - 0.5\ \beta_i \sum_{j=1}^{3} \lambda_{2j}\ \ln p_j) * (OA^{0.5}/w_i) \tag{5.17}$$

where λ_2 is the estimated coefficient for other advertising and *OA* is brand advertising expenditures.

Econometric Consideration

System Approach to Model Estimation

In this study, models (5.1) and (5.2) were estimated using a system approach. Seemingly unrelated regressions (SUR) estimation techniques are applied. A system of *n* equations is called a system of seemingly unrelated regression equations when the error terms of each equation are contemporaneously related with the error terms of other equations. Such a system with *n* equations can be expressed as:

$$y_i = X\beta_i + \varepsilon_i \qquad i=1,\ldots\ldots,n \tag{5.18a}$$

where $\varepsilon = [\varepsilon'_1, \varepsilon'_2, \varepsilon'_3, \ldots\ldots\ldots, \varepsilon'_n]'$ has $E(\varepsilon) = 0$. Correlations between disturbances in different equations are expressed as:

$$E(\varepsilon'_{it}\varepsilon_{js}) = \sigma_{ij} \qquad \text{for } i, j = 1,\ldots\ldots,n$$

where σ_{ij} are the elements of the variance covariance matrix of the residuals. All non-contemporaneous disturbances are, however, uncorrelated and so

$E(\varepsilon'_{it}\varepsilon_{js}) = 0$ for t≠s.

A total of T observations are used in estimating the parameters.

Equation (5.18a) may be expressed in the following form:

(5.18b)
$$\begin{pmatrix} y_1 \\ y_2 \\ . \\ . \\ y_n \end{pmatrix} = \begin{pmatrix} x_1 & 0 & . & . & 0 \\ 0 & x_2 & . & . & 0 \\ . & . & . & . & . \\ & . & . & . & . \\ 0 & 0 & . & . & y_n \end{pmatrix} \begin{pmatrix} \beta_1 \\ \beta_2 \\ . \\ . \\ \beta_n \end{pmatrix} + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ . \\ . \\ \varepsilon_n \end{pmatrix}$$

More compactly (5.18b) follows as:

$$y = X\beta + \varepsilon$$

where y is a vector of the dimension (TN x 1), X is (TN x k) matrix, β is a vector of length $k = \sum_{i=1}^{N} k_i$ and ε is a (TN x 1) vector. Standard distribution properties are $E(\varepsilon) = 0$ and $E(\varepsilon_i \varepsilon_j') = V = \sigma_{ij} I_T$.

or

(5.19)
$$E(\varepsilon\varepsilon') = V = \begin{pmatrix} \sigma_{11}I_T & \sigma_{12}I_T & . & . & \sigma_{1n}I_T \\ \sigma_{21}I_T & \sigma_{22}I_T & . & . & \sigma_{2n}I_T \\ . & . & . & . & . \\ . & . & . & . & . \\ . & . & . & . & . \\ \sigma_{nI}I_T & \sigma_{n2}I_T & . & . & \sigma_{nn}I_T \end{pmatrix}$$

and

(5.20)
$$\Sigma = \begin{pmatrix} \sigma_{11} & \sigma_{12} & . & . & \sigma_{1n} \\ \sigma_{21} & \sigma_{22} & . & . & \sigma_{2n} \\ . & . & . & . & . \\ . & . & . & . & . \\ . & . & . & . & . \\ \sigma_{nI} & \sigma_{n2} & . & . & \sigma_{nn} \end{pmatrix}$$

so (5.19) is

(5.21) $$V=\Sigma\otimes I$$

and

(5.22) $$V^{-1}=\Sigma^{-1}\otimes I$$

Each equation in the system can be estimated consistently, if not efficiently, using classical OLS. However, with the stacked system (5.18) the generalized least square (GLS) technique is applied. GLS provides efficient estimates of the parameters.

Denoting the *ij*th element in Σ^{-1} by σ^{ij}, the GLS estimator is:

(5.23) $$\begin{aligned}\hat{\beta}&=[X'V^{-1}X]^{-1}X'V^{-1}y\\&=[X'(\Sigma^{-1}\otimes I)X]^{-1}X'(\Sigma^{-1}\otimes I)y\end{aligned}$$

The GLS estimator (5.23) is different from OLS only due to the contemporaneous relationship among the disturbance terms. An important question is how much efficiency is gained by using GLS instead OLS. Following Greene (1993),

1. if the disturbance relationship across equations does not exist then $\beta_{GLS} = \beta_{OLS}$
2. if the equations have identical explanatory variables then $\beta_{GLS} = \beta_{OLS}$.

Thus, the greater the correlation of the disturbances the greater will be the efficiency gain by using the GLS. Similarly, the lesser the correlation between the X matrices (matrices of independent variables) the greater will be the efficiency gain from the GLS.

It is often the case that Σ in (5.23) is unknown. The OLS residuals may be used to estimate the elements of Σ with:

(5.24) $$\sigma_{ij}=e_ie_j/T$$

In this situation equation (5.23) becomes a feasible generalized least square estimator (FGLS). The large sample properties of FGLS, however, do not depend on the unbiased estimates of Σ. Often an iterative procedure is used to obtain consistent parameter estimates. Such estimators are called iterative FGLS estimators. Iterative FGLS is a maximum likelihood estimator (MLE) if elements of Σ are based on equation (5.24).

Restricted GLS

As discussed above, OLS estimate of the parameters are inefficient if there exists a contemporaneous relationship among disturbances in the equations. Hence, the GLS or the FGLS estimators are used. In addition, the models are estimated by imposing a set of linear restrictions based on demand conditions: homogeneity and symmetry. Such linear restriction may be expressed as

$$R\beta = r \tag{5.25}$$

where R is the known matrix of $q \times k$ with $q \leq k$, and r is a known q-element vector. R has full rank, that is, there are no linear dependencies between hypotheses. Then the best unbiased constrained estimators of the parameters can be written as

$$\hat{\beta}_{CGLS}=\hat{\beta}_{GLS}+[X'V^{-1}X]^{-1}R'[R(X'V^{-1}X)^{-1}R']^{-1}(r-R\hat{\beta}_{GLS}) \tag{5.26}$$

where $\hat{\beta}_{GLS}$ is equation (5.23) and the variance-covariance matrix is written as:

$$Var(\hat{\beta}_{CGLS})=[X'V^{-1}X]^{-1}-[X'V^{-1}X]^{-1}R'(R(X'V^{-1}X)^{-1}R')^{-1}R(X'V^{-1}X)^{-1} \tag{5.27}$$

Equations (5.1) and (5.2) represents a set of three equations, one for each retail outlets for fresh-cut flowers. To estimate the set of equations it is necessary to drop one of the equations and derive the parameters for the dropped equation using adding-up restriction. The adding-up restriction is built in the share models like AIDS. An objective of these models is to accomplish optimal allocation of the pre-determined expenditures for the sub-groups among the individual elements in the group. In doing so the pre-existing condition is that the sum of the individual has to equal to the pre-determined total. This condition is represented by adding-up criteria. Due to this condition the disturbance covariance matrix, Σ is singular(Chung, 1997). Since Σ is singular neither FGLS nor iterative FGLS (which may converge into MLE) can be used to estimate the system of equation. This situation can be remedied by dropping one of the three equations in the system.

An Overview of NPD Data Set and Description of Variables

The data used in the models were from a consumer panel known as National Panel Diary (NPD) Group. The NPD group is an independent company that maintains a panel of consumers across the U.S. with the purpose of recording changes in the consumption behavior and attitude in relations to various consumer items such as beef, flowers, and others. In case of fresh-cut flowers, the NPD maintains a continued survey of consumers who report the types of flowers bought, the retail outlets where they were bought, quantity, amounts spent, reasons for buying at particular outlets, and reasons for buying flowers, and the demographics of each household. A large number of data points are recorded monthly across consumers for the years since 1992 for the entire U.S. As discussed earlier the household data were projected to reflect certain aggregate level including national level. The data used in this study, therefore, were available in aggregate forms. The demand equation considered so far in Chapter 4 and 5 relate to a single consumer. Thus it is important to discuss to what extent the characteristics relating to individual demand can be carried over to aggregate or market demand. Most importantly an aggregation across households assumes that the existence of aggregate utility function that represents the individual preferences. The demand functions are then derived from the "social" utility maximization procedures as explained in Chapter 4. According to Sonnenschein (1973) there is only little left of demand theory beyond homogeneity at the aggregate level. Theil (1968, 1971) used a statistical approach called convergence approach to show that the individual household equation of Rotterdam model can be aggregated to represent market demand. Deaton and Mealbaur ((1980) discuss extensively the theoretical conditions that have to be met for such aggregate preferences. They ask a question: under what conditions can we say that aggregate demand functions reflect the characteristics of a "representative household," in the sense that they will be function of a representative income level and a set of prices faced by all households in the group. They specified a representative cost function of each household having special form known as price specific generalized linearity log (PIGLOG) form such that the demand function derived from that can be exactly added up over households. Since the almost ideal demand system discussed in Chapter 4 and 5 is derived from such type of cost function, the demand system can be made to add up exactly over households and thus to generate aggregate demand functions that are directly compatible with individual utility maximization.

Description and Definitions of Selected Variables

Specific variables relevant for the objectives of this study include: 1) monthly quantity of total fresh-cut flowers bought from each of the three retail outlets: florists, supermarkets, and others; 2) a dollar amounts spent on cut flowers at each of the three retail outlets; 3) attitude variables, which include reasons behind buying flowers for gifts to others and for personal use; 4) dummy variables to indicate special buying occasions, other buying occasions, and the rest of the buying days; and 5) monthly expenditures on generic promotions, namely PromoFlor, 6) monthly expenditures on brand advertising including FTD and 1-800 numbers. Appendix B includes a description of variables used in the study.

Table 5-1: List of four U.S. regions used in the analysis.

Region 1 (North)	Region2 (Central)	Region 3 (South)	Region 4 (West)
New England: Maine, New Hampshire, Vermont, Massachusetts, Rhode Islands and Connecticut	East North Central: Ohio, Indiana, Illinois, Michigan, and Wisconsin	South Atlantic: Maryland, Delaware, Washington D.C., Virginia, West Virginia, North Carolina, South Carolina, Florida, and Georgia	Mountain: Montana, Wyoming, Colorado, Idaho, New Mexico, Nevada, Arizona, Utah
Mid Atlantic: New York, New Jersey, and Pennsylvania	West North Central: Minnesota, Iowa, Missouri, Nebraska, Kansas, North Dakota, and South Dakota	East South Central: Kentucky, Tennessee, Alabama, Mississippi	Pacific: Washington, Oregon, California
		West South Central: Arkansas, Louisiana, Oklahoma, Texas	

To conduct an analysis for independent income groups, data for 1-3 above were obtained for each of four income groups: less than $25,000; between 25,000 and $49,999; between $50,000 and $74,999; $75,000 and over. Also, 1-3 above were obtained for four U.S. regions (Figure 1-1). Table 5-1 provides a list of the four broad geographic regions in the U.S. including the states in each region.

Monthly nominal household expenditures on flowers were divided by monthly urban CPI to obtain monthly real expenditures. Advertising expenditures were also normalized using a monthly urban CPI. Real per unit prices of all cut flowers, arrangements, single stems, and bouquet/boxes/corsage were obtained by dividing real expenditures by quantity of flowers purchased.

The dependent variables in the empirical models are shares of each of the three retail outlets. These shares are obtained by dividing the expenditures at each retail outlet by the total expenditures on flowers in the three outlets.

Dummy Variables Used in the Models

U.S. cut flower consumption at the household level is characterized by seasonal fluctuations in consumption levels. There are a few special occasions when fresh-cut flowers purchases are higher than the regular purchasing periods. In term of volume of purchase these buying days can be grouped into three main groups: special buying occasions including Mother's Day, Valentines Day and Christmas; other buying occasions including Boss's Day, Easter, Fathers Day, Grand Parent Day, Halloween, St. Patrick Day, Secretary Day, Sweetest Day, and Thanksgiving Day; and rest of the buying days in a calendar year. Two dummy variables are used to represent the three groups of buying days. If buying days fall in the first group then the first dummy variable will have the value of one, otherwise it will have the value of zero; and if buying days fall in the second group then the second dummy variable will have value of one, otherwise zero. This way three buying groups are represented by two dummies. An alternative method of capturing the buying occasions is by using a seasonal index. However, since these buying days are apart without following a consistent number of days or months, designing a particular type of seasonality index that can capture all of the identified buying occasions is hard. Although there may be some limitations from using dummy variables in terms of the model results given the buying pattern the variable approach is judged to be the most appropriate.

Descriptive Statistics of Variables Used in the Empirical Models

Table 5-2 reports descriptive statistics of variables used in the models for overall fresh-cut flowers excluding the dummy seasonal variables. Descriptive statistics for the three types of flowers and for the four U.S. regions are reported in Table B-2 to B-4 in Appendix B. Descriptive statistics include the mean and the standard deviation of each of the variable in each income group. Note that prices and expenditures are in nominal terms. As shown in Table 5-2, florists' share of the fresh-cut flower market was the highest among all retail outlets in all income groups, while that of supermarkets was higher than other types of outlets in all income groups except the income group with incomes of $75,000 and more. Market shares varied among the three retail outlets across different types of fresh-cut flowers. For arrangements, florists had higher dominance compared to single stems and bouquet/boxes/corsage. As shown by coefficient of variations (C.V.) there were less variability in market shares for florists in all income groups compared to supermarkets and other outlets. Prices varied much more for other outlets than for florists and supermarkets in all income groups.

Descriptive statistics for retail prices, expenditures, and markets shares across the four U.S. regions are reported in Table B-3. The pattern in the distribution of market shares among the three outlets across the U.S. regions largely followed the overall U.S. average. However, the share and price variations were much higher across the regions compared to the average.

Table 5-2 and Table B-4 in Appendix B report descriptive statistics for those attitude variables associated with reasons behind buying gifts for self and for giving gifts to others. The five variables in the gifts-to-self category constituted more than 90 percent of the respondents while that in the gifts-to-others category constituted more than 70 percent of the respondents. In the gifts-to-elf category "decorate my garden/home" was the single most important reason for buying flowers followed by "caught my eyes." However, across the regions " makes me feel happy"and "treat myself" were equally important reasons for buying flowers for self. In the gifts-to-others category, "romantic," "like to give flowers" and "other reasons" were of equal importance. This pattern was similar across the U.S. regions.

Table 5-2: Descriptive statistics of key variables in AIDS model for overall fresh-cut flowers.

	Income Group :1 (Under $25,000)		**Income Group :2 ($25,000 to $49,999)**		**Income Group :3 ($50,000 to $74,999)**		**Income Group :4 (Over $75,000)**	
	Mean	C.V.	Mean	C.V.	Mean	C.V.	Mean	C.V.
Expenditures (million dollar)	$18.77	0.37	$30.29	0.40	$19.74	0.38	$15.55	0.42
Shares:								
Florists	65.15%	0.12		0.10	71.84%	0.10	62.58%	0.17
Super Markets	18.99%	0.27	67.88%	0.21	15.67%	0.31	17.65%	0.31
Others	15.86%	0.51	12.74%	0.36	12.50%	0.44	19.77%	0.44
Prices (per transaction):								
Florists	$9.76	0.25	$9.25	0.32	$10.51	0.34	$12.06	0.41
Super Markets	$1.95	0.31	$2.18	0.28	$1.98	0.40	$2.19	0.35
Others	$2.63	0.56	$3.24	0.46	$3.31	0.41	$4.14	0.60
Gift for Self (percent of respondents):								
Caught My Eyes	17.29	0.26	16.52	0.26	13.17	0.29	14.09	0.29
Decorate my garden	54.05	0.11	61.18	0.10	64.94	0.10	63.19	0.13
Makes me feel happy	5.97	0.40	4.43	0.35	4.17	0.52	4.76	0.56
Treat myself	6.47	0.36	4.65	0.40	4.52	0.57	3.61	0.58
Other	9.91	0.34	7.91	0.35	7.16	0.35	6.42	0.43
Gift to Others (percent of respondents):								
Communicates Feelings	10.27	0.28	12.40	0.24	12.67	0.30	12.51	0.31
Like to give flowers	12.00	0.25	12.85	0.19	14.66	0.24	15.58	0.20
Romantic	17.70	0.19	19.41	0.17	18.69	0.22	19.71	0.26
Makes recipient feel special	6.17	0.63	6.83	0.56	7.33	0.52	6.59	0.58
Others	17.09	0.21	13.50	0.21	12.20	0.22	10.18	0.34

Although there was lack of any specific pattern, variability in response was much higher across regions compared to U.S. average and higher among upper income groups compared to lower income groups.

Attitude Variables and Principal Component Analysis

For some attitude related questions the responses may be highly correlated. That can be particularly true for attitudinal variables where an intensity of feeling for one response versus another is similar. For example, responses like "communicates feelings" and "romantic" may be correlated or "makes me feel happy" and "treat myself" may be correlated. In those situations where variables can be grouped, creating an index variable representative of the information found within the group may be more desirable. Procedure such as principal component provides an avenue for creating an index from the highly correlated variables (Ward, 1994).

Following Moon (1995), the principal component method can be illustrated as follows. Assume a classical linear model:

$$Y=X\beta+U \tag{5.28}$$

where β is a $k \times 1$ vector of unknown parameters to be estimated that are associated with the independent variables included in $(n \times k)$ X matrix and U is a vector of normally distributed disturbances. Let W be the $k \times k$ matrix consisting of $k \times 1$ orthonormal characteristic vectors (w_i) of the correlation matrix $(X'X)$. Then, the $n \times k$ matrix of principal components has the following relations to X:

$$Z = XW \quad \wedge ZW' = X \tag{5.29}$$

where, $W^{-1} = W'$ by orthogonality

Substituting equation (5.29) into (5.28) for X, the relationship between Y and the principal components is defined as:

$$Y = ZW'\beta + U = Z\beta^{*} + U \tag{5.30}$$

where $\beta^{*} = W'\beta$ is the $k \times 1$ vector of parameters corresponding to the principal components $\boldsymbol{Z}$. OLS estimates of β^{*} can be derived as:

$$\begin{aligned} \beta^{*} &= (Z'Z)^{-1} Z'Y \\ &= (W'X'XW)^{-1} W'X'Y \qquad (5.31) \\ &= W'(X'X)^{-1} WW'X'Y \\ &= W'(X'X)^{-1} X'Y \\ &= W'\beta \end{aligned}$$

Hence, the OLS estimates of the original parameters in equation (5.28) can be recovered as:

$$\beta = W\beta^{*} \qquad (5.32)$$

To see the recovering process of original parameters in greater detail, assume the following principal components regression model:

$$Y_i = \beta_0^{*} + \beta_1^{*} Z_{1i} + \beta_2^{*} Z_{2i} + \ldots\ldots e_i \qquad (5.33)$$

Note that the Z_i's are completely orthogonal. Substituting for Z_i's, the equation can be expressed in terms of the original variables as shown below:

$$Y_i = \beta_0^{*} + \Sigma_j (\beta_1^{*} W_{1j} + \beta_2^{*} W_{2j} + \ldots\ldots + \beta_j^{*} W_{jj}) X_{ji} + e_i \qquad (5.34)$$

Then, the marginal effect of the variables X_{ji} on Y_i could be expressed as:

$$\frac{\partial Y_i}{\partial X_{ji}} = \beta_1^{*} W_{1j} + \beta_2^{*} W_{2j} + \ldots + \beta_j^{*} W_{jj} \equiv \beta_j \qquad (5.35)$$

which is exactly an expanded form of equation (5.32).

Usually the principal component estimator of β is obtained by deleting one or more of the variables Z_i. The most common criterion of deleting some of the principal components is based on eigenvalues (characteristic roots) by eliminating components having small characteristic roots

(Mittelhammer and Baritelle, 1977). This criterion is useful in the sense that principal components having small characteristics roots account for only a small part of the variation in the X variables. This property can be demonstrated through decomposition of total variation (TV) in the X variables:

$$
\begin{aligned}
TV(X) &= tr(X'X) = tr(X'XWW') \\
&= tr(W'X'XW) \\
&= T\textstyle\sum_{i=1}^{k}\lambda_i
\end{aligned}
\tag{5.36}
$$

Here, W was used to diagonalize (X'X)/T. The TV in the component Z is equal to TV(X), since W'X'XW = Z'Z. Therefore, the proportion of the total variation in the data set is accounted for by the ith component is given by:

$$
\begin{aligned}
\frac{V(Z_i)}{TV(Z_i)} &= \frac{T\lambda_i}{T\sum_j \lambda_j} \\
&= \frac{\lambda_i}{\sum_j \lambda_j}
\end{aligned}
\tag{5.37}
$$

The smaller characteristic root for λ_i, implies a smaller proportion of the total variation accounted for by component Z_i.

For the expenditures allocation models two sets of independent variables were identified to be highly correlated. The first set is made of attitudes toward buying flowers for ones self. The second set includes variables related to attitude toward buying flowers for gifts to others. For example, the correlation matrix, eigenvalues, and loading factor for variables belonging to buying gift-to-self group with below $25,000 income for the total U.S. are tabulated in Tables 5.3, 5.4, and 5.5 respectively.

If highly correlated raw variables were used in regression analysis, it becomes quite hard to distinguish the effect of one variable from another. In extremes cases when variables are linear combinations of each other, it becomes impossible to achieve solutions. Using the principal component approach, a new set of orthogonal explanatory variables (Z) as weighted combinations of original variables can be used as suggested in equation (5.33). Determining the number of variables that should be included in the regression analysis can be based on eigenvalues of each principal component. The eigenvalues for buying-flowers-for-self variables for income group less than $25,000 for total U.S. fresh-cut flowers market is given in Table 5-4. The variance of the first principal component of buying-flowers-for-self variables was 2.9061153 and accounted for 0.58 percent of the total variance of the five variables in the flowers-for-self category.

Table 5-3: Correlation matrix of buying-flowers-for-self variables for income group less than $25,000 for overall U.S. fresh cut flowers market.

	Caught my eyes	Decorate my garden	Makes me feel happy	Treat myself	Other
Caught my eyes	1.00000				
Decorate my gardens	-0.73112	1.00000			
Makes me feel happy	0.40403	-0.68908	1.00000		
Treat myself	0.35629	-0.57586	0.39344	1.00000	
Other	-0.53187	0.21640	-0.29265	-0.51778	1.00000

The loading factors are given in Table 5-5. In the first principal component the weights (factor loadings) are about equal so that each variable is about equally represented in the linear composite. Note that sign of the second principal component is negative suggesting contrast about "caught my eyes" and "decorate my garden" in terms of their effects in purchase decisions.

In the next chapter these principal components are incorporated into the full AIDS model along with other variables in order to evaluate advertising and other effects on the household expenditure allocations on flowers as discussed in this chapter.

Table 5-4: Eigenvalues for buying-flowers-for-self variables for income group less than $25,000 for overall U.S. fresh cut flowers market.

	Eigenvalues	Cumulative R-squared
Caught my eyes	2.9061	0.5812
Decorate my gardens	0.9120	0.7636
Makes me feel happy	0.6489	0.8934
Treat myself	0.4882	0.9910
Other	0.0446	1.0000

Table 5-5: Factor loadings for buying-flowers-for-self variables for income group less than $25,000 for overall U.S. fresh cut flowers market.

	Z_1	Z_2	Z_3	Z_4	Z_5
Caught my eyes	0.8065	0.0345	0.5614	0.1486	0.1043
Decorate my gardens	-0.8714	0.4121	-0.0435	-0.2206	0.1417
Makes me feel happy	0.7365	-0.4176	-0.1924	-0.4929	0.0547
Treat myself	0.7393	0.2523	-0.5376	0.3100	0.0667
Other	-0.6379	-0.7091	-0.0759	0.2796	0.0789

CHAPTER 6
GENERAL EMPIRICAL RESULTS

This chapter includes general results from the expenditure allocation models and their analyses. The first section provides an overview of the model equations and explanatory variables in each equation. Results from diagnosis tests about the soundness of models from econometric points of view (e.g., test of auto-correlation, test of heteroscedasticity, and stability of demand models) are reported in the second section. The third section presents and analyzes the parameter estimates of all the models with particular attention given to their significance levels for overall fresh-cut flowers models. Secondary levels of analyses are completed for different types of flowers and across the U.S. regions. Most of the secondary level analyses results are shown in the appendices.

Model Equations and Explanatory Variables

Expenditure allocation models based on the AIDS specifications were estimated for two types of relationships among income groups: 1) no relationship across income groups, and 2) relationship across income groups. Econometrically the above types of relationships imply that models can be estimated in two ways: 1) a system of equations for each group is estimated independently for each income group, and 2) systems of equations for all income groups are estimated together. Table 6-1 provides an explanation of each of the equations used in the model. Households in each income group allocated their expenditures on flowers among three types of retail outlets, namely florists, supermarkets, and other outlets. Models were estimated for overall fresh-cut flowers, for three specific types of fresh-cut flowers (i.e., arrangements, single stems, and corsage/bouquet/boxes), and finally for fresh-cut flowers among the four defined U.S. regions. Thus, for each type of fresh-cut flowers a demand system comprised three equations, one each for each retail outlet type. One of the equations was dropped since the outlet shares must sum to one as explained in Chapter 5. The parameters for the dropped equation were determined using the imposed demand conditions.

Table 6-1: Explanation of equations included in the models.

Model Equation Names	Explanations
Equation 11	Equation in income group one representing Florists
Equation 12	Equation in income group one representing Supermarkets
Equation 13	Equation in income group one representing Other Outlets
Equation 21	Equation in income group two representing Florists
Equation 22	Equation in income group two representing Supermarkets
Equation 23	Equation in income group two representing Other Outlets
Equation 31	Equation in income group three representing Florists
Equation 32	Equation in income group three representing Supermarkets
Equation 33	Equation in income group three representing Other Outlets
Equation 41	Equation in income group four representing Florists
Equation 42	Equation in income group four representing Supermarkets
Equation 43	Equation in income group four representing Other Outlets

Standard errors for the determined parameters were estimated using the variance-covariance matrix of the estimated parameters. Therefore, when models were estimated within each income group, the system included only two equations after dropping the third one. However, when the

Table 6-2: Definition of explanatory variables used in the expenditure allocation models.

Variable Name	Definition	Variable Name	Definition
LP11	Log of price at Florists for income group 1	D1	Dummy variable indicating special consumption occasions
LP12	Log of price at Supermarkets for income group 1	D2	Dummy variable indicating other special consumption occasions
LP13	Log of price at Other Outlets for income group 1	SPC11	First Principal Component representing reasons for buying flowers for self by income group 1
LP21	Log of price at Florists for income group 2	SPC12	Second Principal Component representing reasons for buying flowers for self by income group 1
LP22	Log of price at Supermarkets for income group 2	SPC21	First Principal Component representing reasons for buying flowers for self by income group2
LP23	Log of price at Other Outlets for income group 2	SPC22	Second Principal Component representing reasons for buying flowers for self by income group 2
LP31	Log of price at Florists for income group 3	SPC31	First Principal Component representing reasons for buying flowers for self by income group 3
LP32	Log of price at Supermarkets for income group 3	SPC32	Second Principal Component representing reasons for buying flowers for self by income group 3
LP33	Log of price at Other Outlets for income group 3	SPC41	First Principal Component representing reasons for buying flowers for self by income group 4
LP41	Log of price at Florists for income group 4	SPC42	Second Principal Component representing reasons for buying flowers for self by income group 4

Note: All prices are in unit of transaction and expenditures are in million dollars as are the promotion expenditures.

Table 6-2 continued.

LP42	Log of price at Supermarkets for income group 4	GPC11	First Principal Component representing reasons for buying flowers for gifts to others by income group 1
LP43	Log of price at Other Outlets for income group 4	GPC12	Second Principal Component representing reasons for buying flowers for gifts to others by income group 1
LX1	Log of total expenditures allocated for fresh-cut flowers by income group 1	GPC21	First Principal Component representing reasons for buying flowers for gifts to others by income group 2
LX2	Log of total expenditures allocated for fresh-cut flowers by income group 2	GPC22	Second Principal Component representing reasons for buying flowers for gifts to others by income group 2
LX3	Log of total expenditures allocated for fresh-cut flowers by income group 3	GPC31	First Principal Component representing reasons for buying flowers for gifts to others by
LX4	Log of total expenditures allocated for fresh-cut flowers by income group 4	GPC32	Second Principal Component representing reasons for buying flowers for gifts to others by
		GPC41	First Principal Component representing reasons for buying flowers for gifts to others by income group 4
		GPC42	Second Principal Component representing reasons for buying flowers for gifts to others by income group 4
		PF	PromoFlor Expenditures
		OA	Brand Advertising Expenditures

Note: All prices are in unit of transaction and expenditures are in million dollars as are the promotion expenditures.

models were estimated across income groups then the system of equations included eight equations, two for each income group.

Each equation used market shares as the dependent variable and real prices, real total expenditures, dummies variables for seasonality in consumption, principal components for behavioral or attitude variables, and real advertising expenditures for PromoFlor and brand advertising as independent variables. Table 6-2 describes the types of explanatory variables used in the models. Note that explanatory variables reported in Table 6-2 are used in analyzing overall fresh-cut flowers, other three types of fresh-cut flowers, and fresh-cut flowers in four U.S. regions.

Diagnostic Tests and Stability of Demand Models

Tests of Auto-correlation and Heteroscedasticity

When the error term for one period is correlated with the error term in the next period, OLS standard errors are biased. Tests of autocorrelation of the error terms were performed using the Durbin-Watson (D.W.) test for first-order autocorrelation. Similarly, when error terms do not have the same variance, OLS standard errors are biased. Although in case of time series data the problem of heteroscedasticity may be less typically, the models are tested for heteroscedasticity. Models were tested for heteroscedasticity using Lagrange Multiplier (LM) test developed by Breusch and Pagan. The hypothesis of this method was that $\sigma^2_i = \sigma^2 f(\alpha_0 + \alpha' z_i)$ where z is a vector of independent variables. The model is homoscedastic if $\alpha = 0$. In other words, the models are homoscedastic if we failed to reject that $\alpha = 0$ at a certain level of significance, which in our case was .05. The tests were carried out with simple regression as explained in Green (1996). Table 6-3 reports the results of both the tests for models used in analyzing overall fresh-cut flowers. Both tests were conducted at .05 significance level.

Table 6-3: Tests of heteroscedasticity and auto-correlation for models of fresh-cut flowers.

	Across Income				Within Income			
	D.W	Test Result	LM HT	Test Result	D.W	Test Result	LM HT	Test Result
Equation 11	1.84	IC	0.47 [0.49]	FR	1.92	FR	0.60 [0.43]	FR
Equation 12	1.83	IC	0.42 [0.51]	FR	1.92	FR	0.52 [0.46]	FR
Equation 21	2.08	FR	0.80 [0.37]	FR	2.10	FR	0.88 [0.34]	FR
Equation 22	2.00	FR	3.60 [0.06]	FR	2.08	FR	2.38 [0.12]	FR
Equation 31	1.62	IC	0.00 [0.98]	FR	1.89	IC	0.16 [0.68]	FR
Equation 32	1.68	IC	0.14 [0.70]	FR	1.82	IC	0.15 [0.69]	FR
Equation 41	1.51	IC	1.79 [0.18]	FR	1.50	IC	0.96 [0.32]	FR
Equation 42	1.43	IC	0.41 [0.52]	FR	1.48	IC	0.36 [0.54]	FR

IC=Inconclusive at 5% significance level, FR=Fail to Reject the hypotheses: 1) there were no auto-correlations, 2) there were no heteroscedasticity at 5% significance level, D.W.=Durbin Watson, LM HT=Lagrange Multiplier Hetroscedasticity Test.
Note: Numbers in parentheses are probability values.

Table 6-3 shows that none of the auto-correlation tests indicated conclusively a problem at the .05 significance level. Similarly, in case of within income group estimates the D.W. tests rejected existence of auto-correlation for four out of eight equations and showed inconclusive results for the remaining four equations. The heteroscedasticity test results showed that for both across income and within income models the existence of heteroscedasticity was rejected at .05 significance level. Note that Table 6-3 reports test results for models relating to overall fresh-cut flowers only.

Stability of the Models

Results from empirical demand analyses are considered to be theoretically consistent only when those results follow basic demand conditions. While estimating the models, homogeneity, symmetry, and adding-up demand conditions were imposed. Whether those demand conditions were obeyed by the empirical models may be evaluated using a likelihood ratio (LR) test, Lagrange Multiplier test, and a Wald test. The fourth fundamental condition of demand is negativity. This condition arises from the assumption about the shape of the preference curve of a consumer. In consumer theory we begin with the assumption that a rational consumer has a convex shaped preference curve. The implication of convexity of preference or concavity of the utility function is that the Hessian matrix (matrix of second derivatives) is negative semi-definite. A matrix is negative semi-definite when the principal minors of the Hessian determinant or the characteristics roots of the Hessian matrix alternate in sign starting with the negative first principal minor.

The results of the negativity tests for the AIDS model for overall fresh-cut flowers are shown in Table 6-4. Results for three specific types of fresh cut-flowers and fresh-cut flowers in four U.S. regions are included in Appendix D.

Table 6-4: Test of model stability using negativity tests for within and across income group estimates.

Test of negativity	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Within Income Group:				
First Principal minor	-0.15275	-0.11236	-0.13892	-0.10492
Second Principal minor	0.00321	0.00540	0.00638	0.00568
Entire matrix	0.00000	0.00000	-0.00000	-0.00000
Across Income Group:				
First Principal minor	-0.14197	-0.11149	-0.13398	-0.11136
Second Principal minor	0.00381	0.00566	0.00663	0.00679
Entire matrix	0.00000	0.00000	-0.00000	-0.00000

According to Table 6-4 negativity conditions were satisfied for all eight model estimates. All first principal minors were negative in signs and all second principal minors were positive in signs. Although signs for the determinants of the entire Hessian matrix were not negative for all income groups, they all were zeros indicating at least weak concavity of the utility function.

Parameter Estimates and their Statistical Significance

A total of 32 sets of estimates for within income groups and eight sets of estimates for across income groups were obtained using maximum likelihood procedures for seemingly unrelated regressions (SUR). A TSP program showing the estimation codes is attached in Appendix C. Tables 6-5 reports the number of observations, likelihood function values and number of iteration before convergence was achieved for within income groups and across income groups for overall fresh-cut flowers.

Table 6-5: Number of observation used by the models, likelihood function value and number of iterations for overall fresh-cut flowers.

Model	Number of Observation	Likelihood Function	Number of iteration before convergence
Within Income Group Estimates:			
Fresh-cut flower: Income group 1	56	178.97	5
Fresh-cut flower: Income group 2	56	247.05	4
Fresh-cut flower: Income group 3	56	205.34	6
Fresh-cut flower: Income group 4	56	179.80	4
Across Income Group:			
Fresh-cut flower: Income group I to 4	56	826.03	15

As reported in Table 6-5 all the model estimates relating to fresh-cut flowers used the full set of observation while estimating within and across income group models. Some models for specific types of fresh-cut flower and the U.S. regions (Appendix D) had few zero observation for shares due to zero expenditures on particular outlets. For these observations prices also did not exist.

The results from the expenditure allocation models using the AIDS specification were estimated and reported for overall fresh-cut flowers in Table 6-6 and 6-7. Results relating to three specific types of flowers and the four U.S. regions are provided in Appendix D. Table 6-6 includes parameter estimates and their standard errors for within income group and Table 6-7 includes parameter estimates and their standard errors for across income groups. An asterisk indicates significant coefficients at the .05 confidence level.

The model coefficients were divided into five groups: price effects, expenditure effects, seasonality effects, advertising effects, and behavioral effects. Price and expenditure effects constituted key parameters to evaluate the demand characteristics of fresh-cut flowers. It is important to note that given that the full version of the AIDS model is highly nonlinear, the parameter signs for different effects reported in the tables themselves may not indicate whether the estimated demand coefficients have signs consistent with the economic theory. However, in the following chapters this issue will be addressed using the signs of the calculated elasticities. In this section we largely focus on the significance levels of the estimated parameters. Also note that some of the parameters were calculated using imposed restrictions on the models consistent with the demand theory presented earlier. The standard errors for those coefficients were estimated based on the variance-covariance matrix of originally estimated parameters. Thus, for each income group 21 out of 33 parameters were estimated directly. Imposed demand conditions like symmetry and homogeneity were used to derive the parameters for price effects and adding-up conditions are used to derive the parameters for expenditure effects. For other effects such as seasonality, advertising expenditures, and behavioral effects homogeneity like conditions that restricts change in the total market share were used. Accordingly variables like seasonality, advertising, and behavior may have reallocated market shares among the retail outlets but the total market size remained unchanged.

Price Effects

Price effects (γ_{ij}) indicate the impact of change in relative prices on the market shares among the retail outlets. All the price effects for within and across income group estimates for overall fresh-cut flowers (Table 6-6 and 6-7) were significant at .05 level except for income group 3. While comparing within and across income group estimates, the magnitude of the coefficients and signs were found to be similar across the four income groups.

While many price coefficients for the overall fresh-cut flowers were statistically significant, only few significant price effects for both within and across income groups appeared for fresh-cut flowers by type and U.S. regions. The significance showed up more for the lower income groups than for higher income groups. This implied that lower income groups were more susceptible to relative price changes than the higher income groups. Price effects were mostly significant for income group 2 in region 1 and 3; region 2 had significant results for price effects in income group 1 and region 4 showed similar results for income group 4. Interestingly when the parameters were estimated across income groups (Table 6-7) none of the price effects were significant for income group 3, while the rest of the income groups still had significant results.

Expenditure Effects

Expenditure effects (β_i) explained whether the retail outlet market shares changed with changes in total household expenditures on fresh-cut flowers. For overall fresh-cut flowers, expenditure effects were statistically significant for all outlets in only income group 3 for both within and across income group estimates (Table 6-6 and Table 6-7). For the specific type of flowers and regional levels, significance of expenditure effects varied for both within and across income group estimates (Appendix D).

Table 6-6: Almost Ideal Demand Systems results for total fresh-cut flowers for within income group estimates.

Parameters	Income Group : 1 (Under $25,000)		Income Group : 2 ($25,000-$49,000)		Income Group : 3 ($50,000-$74,000)		Income Group : 4 (Over $75,000)	
	Coeff.	**S.E**	**Coeff.**	**S.E.**	**Coeff.**	**S.E.**	**Coeff.**	**S.E.**
Price Effects								
γ_{11}	0.07173*	0.02754	0.10435*	0.01498	0.00700	0.04705	0.11339*	0.02597
$\gamma_{12}=\gamma_{21}$	-0.03625*	0.01646	-0.04261*	0.01107	-0.02526	0.02485	-0.04937*	0.01251
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.03548	0.02175	-0.06174*	0.00897	0.01827	0.03041	-0.06401*	0.01897
γ_{22}	0.08089*	0.01584	0.03832*	0.01152	0.04717*	0.01779	0.06036*	0.01214
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.04465*	0.01054	0.00429	0.00718	-0.02191	0.01477	-0.01099	0.00947
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.08013*	0.02225	0.05745*	0.00821	0.00365	0.02384	0.07500*	0.01611
Expenditure Effects								
β_1	-0.01789	0.03786	0.01223	0.02578	0.07935*	0.02829	0.04381	0.02914
β_2	-0.00795	0.02100	-0.01529	0.01872	-0.03675*	0.01959	-0.02258	0.01405
$\beta_3=-\beta_1-\beta_2$	0.02584	0.03541	0.00306	0.01613	-0.04260*	0.02229	-0.02123	0.02485
Seasonality: Special Calender Occasions								
τ_{11}	0.01775	0.04017	-0.00401	0.02462	0.03135	0.03495	0.01890	0.04986
τ_{12}	-0.00712	0.02213	0.01519	0.01801	-0.01495	0.02231	-0.01869	0.02259
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.01063	0.03723	-0.01117	0.01562	-0.01640	0.02572	-0.00021	0.04192
Seasonality: Other Calander Occasions								
τ_{21}	-0.01659	0.02895	-0.01119	0.01682	-0.02127	0.02811	-0.05348	0.03611
τ_{22}	0.00755	0.01603	0.03240*	0.01249	0.00520	0.01782	0.02267	0.01632
$\tau_{23}=-\tau_{21}-\tau_{22}$	0.00903	0.02698	-0.02121*	0.01054	0.01607	0.02005	0.03081	0.03028
Advertising Effects: PromoFlor								
λ_{11}	0.00119	0.01051	0.01608*	0.00632	-0.00211	0.01041	0.01121	0.01298
λ_{12}	0.00800	0.00573	-0.00687	0.00462	-0.00292	0.00555	0.00162	0.00593
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.00919	0.00978	-0.00921*	0.00402	0.00503	0.00765	-0.01283	0.01094
Advertising Effects: Other Advertising								
λ_{21}	0.00480	0.00632	0.01065*	0.00402	0.00616	0.00569	0.00117	0.00819
λ_{22}	-0.00006	0.00347	-0.00742*	0.00294	-0.00056	0.00368	0.00637	0.00371
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.00475	0.00592	-0.00323	0.00254	-0.00560	0.00422	-0.00754	0.00687
Behavioral Effects								
ε_{11}	0.00237	0.01459	-0.03022*	0.00971	-0.00141	0.00905	-0.02356	0.01388
ε_{12}	-0.01168	0.00811	0.01679*	0.00712	0.01534*	0.00576	0.01646*	0.00626
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	0.00932	0.01369	0.01343*	0.00606	-0.01393*	0.00661	0.00710	0.01164
ε_{21}	0.00215*	0.00102	-0.00448	0.00756	0.00418	0.00899	0.00965	0.01157
ε_{22}	-0.00068	0.00563	0.00034	0.00548	0.00116	0.00589	-0.00231	0.00526
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	-0.00147	0.00956	0.00414	0.00466	-0.00534	0.00660	-0.00734	0.00969
ε_{31}	0.00712	0.01375	0.04157*	0.01077	-0.00807	0.01020	-0.00803	0.01489
ε_{32}	0.00610	0.00752	-0.02033*	0.00785	-0.00948	0.00644	0.01664*	0.00675
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.01322	0.01289	-0.02125*	0.00672	0.01755*	0.00751	-0.00861	0.01253
ε_{41}	-0.00677	0.00989	-0.00212	0.00639	0.00555	0.00885	-0.00574	0.01251
ε_{42}	0.00300	0.00542	0.00952*	0.00467	-0.00721	0.00578	0.00161	0.00573
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	0.00377	0.00924	-0.00740	0.00408	0.00166	0.00655	0.00413	0.01042

*Indicates statistical significance at 0.05 or less; Coeff=Coefficient; S.E.=Standard Error.

Table 6-7: Almost Ideal Demand Systems results for cut flowers for across income group estimates.

Parameters	**Income Group : 1 (Under $25,000)**		**Income Group : 2 ($25,000-$49,000)**		**Income Group : 3 ($50,000-$74,000)**		**Income Group : 4 (Over $75,000)**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.08504*	0.02261	0.10318*	0.01421	-0.05296	0.06202	0.09969*	0.02841
$\gamma_{12}=\gamma_{21}$	-0.04175*	0.01572	-0.04172*	0.01218	0.00379	0.03105	-0.04143*	0.01169
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.04329*	0.01875	-0.06146*	0.00991	0.04917	0.04074	-0.05826*	0.02166
γ_{22}	0.07277*	0.01514	0.02963*	0.01338	0.02957	0.01987	0.04763*	0.01136
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.03102*	0.01273	0.01209	0.00827	-0.03335*	0.01770	-0.00621	0.00929
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.07430*	0.02257	0.04937*	0.01019	-0.01582	0.03125	0.06447*	0.01834
Expenditure Effects								
β_1	0.00184	0.03621	0.01942	0.02509	0.11374*	0.02602	0.05281*	0.02791
β_2	-0.02995	0.01998	-0.03979*	0.01791	-0.05018*	0.01815	-0.01569	0.01339
$\beta_3=-\beta_1-\beta_2$	0.02811	0.03462	0.02037	0.01518	-0.06357*	0.02143	-0.03712	0.02302
Seasonality: Special Calender Occasions								
τ_{11}	0.01436	0.04092	-0.00793	0.02472	0.01673	0.03717	0.00535	0.05022
τ_{12}	-0.00217	0.02274	0.02843	0.01867	-0.00743	0.02296	-0.02061	0.02234
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.01219	0.03701	-0.02050	0.01524	-0.00930	0.02143	0.01526	0.04231
Seasonality: Other Calender Occasions								
τ_{21}	-0.01932	0.02967	-0.01225	0.01690	-0.02702	0.02957	-0.06827	0.03661
τ_{22}	0.00913	0.01657	0.03623*	0.01301	0.00986	0.01811	0.02303	0.01617
$\tau_{23}=-\tau_{21}-\tau_{22}$	0.01019	0.02682	-0.02399*	0.01033	0.01716	0.02064	0.04524	0.03099
Advertising Effects: PromoFlor								
λ_{11}	0.00197	0.01079	0.01516*	0.00633	-0.00451	0.01098	0.01194	0.01309
λ_{12}	0.00700	0.00595	-0.00511	0.00480	-0.00152	0.00677	0.00063	0.00586
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.00897	0.00974	-0.01005*	0.00396	0.00603	0.02659	-0.01257	0.01110
Advertising Effects: Other Advertising								
λ_{21}	0.00481	0.00646	0.01085*	0.00402	0.00765	0.00606	0.00029	0.00843
λ_{22}	0.00093	0.00360	-0.00862*	0.00303	-0.00109	0.00379	0.00615	0.00382
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.00574	0.00589	-0.00223	0.00247	-0.00656	0.00436	-0.00644	0.00683
Behavioral Effects								
ε_{11}	-0.00021	0.01415	-0.03019*	0.00951	-0.00274	0.00926	-0.02005	0.01362
ε_{12}	-0.01080	0.00775	0.01683*	0.00697	0.01683*	0.00569	0.01511*	0.00596
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	0.01101	0.01322	0.01335*	0.00553	-0.01409*	0.00671	0.00494	0.01114
ε_{21}	-0.00174	0.00990	-0.00236	0.00746	-0.00068	0.00847	0.00632	0.01132
ε_{22}	-0.00160	0.00538	-0.00292	0.00540	0.00359	0.00544	-0.00069	0.00499
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.00333	0.00921	0.00528	0.00425	-0.00291	0.00639	-0.00563	0.00922
ε_{31}	0.00700	0.01325	0.04064*	0.01050	-0.00778	0.01007	-0.01454	0.01454
ε_{32}	0.00746	0.00712	-0.01966*	0.00762	-0.01041	0.00616	0.01685*	0.00642
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.01447	0.01235	-0.02099*	0.00602	0.01819*	0.00749	-0.00232	0.01188
ε_{41}	-0.00471	0.00955	-0.00288	0.00624	0.00912	0.00851	-0.01287	0.01227
ε_{42}	0.00643	0.00516	0.01049*	0.00452	-0.00950	0.00542	-0.00171	0.00546
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	-0.00173	0.00886	-0.0076*1	0.00366	0.00038	0.00644	0.01458	0.00992

*Indicates statistical significance at 0.05 or less; Coeff=Coefficient; S.E.=Standard Error.

Summary of the significant expenditure coefficients are easily seen in Table 6-6 and Table 6-7 for overall fresh-cut flowers and in Table D-1 to D-14 in Appendix D for flowers by types and regions. It is interesting to compare the results shown in the tables. While almost all the price effects for the overall fresh-cut flowers were significant, very few expenditure effects are significant for the overall fresh-cut flowers. There may be a revealing explanation to this. Most households bought flowers in the form of floral products such as arrangements, single stems, corsages, boxes, and bouquets. The expenditure effects that were significant at this detail level may have been netted out at the overall fresh-cut flower level. Also, since the models were estimated for individual income groups part of the income (or expenditure) effects were already captured with these four groups.

Advertising Effects

Advertising effects were estimated for generic advertising (e.g., PromoFlor) and brand advertising including FTD, 1-800 numbers, and others. At the overall fresh-cut flower level PromoFlor had few statistically significant impacts on the market shares of the retail flower outlets as seen the Tables 6-6 and 6-7. In these tables λ_{ij} are advertising coefficients where i=1,2 (i.e., 1= generic advertising, 2= brand advertising), and j=1,2,3 (i.e, 1=florists, 2= supermarkets, and 3= other outlets). PromoFlor affected only the florists in both within income group and across income group estimates. Fewer and fewer significant coefficients for PrmoFlor were found in the more detailed level of the analysis such as fresh-cut flowers by specific type and U.S. regions (Appendix D). While few brand advertising coefficients were significant at the overall fresh-cut flowers level many were significant at detailed levels (Table D-17 in Appendix D). Many of the significant coefficients for brand advertising appeared in household groups with income level between $25,000 and $50,000 for both within and across income group estimates. There were few significant coefficients at the higher income groups too (Appendix D). A more detailed analysis of the promotion effects including the signs of the demand parameters and elasticities is presented in the following chapters. Recall again that similar to the other parameters the promotion parameters were related to outlet choice and not to total flower consumption. Ward's (1997) analysis did show that generic and brand promotions influenced the total demand for fresh-cut flowers. While the discussion on promotions is expanded later, the insignificant coefficients at this point suggest that the generic promotion of fresh-cut flowers was nearly outlet neutral. See the initial discussion in Chapter 4, Figures 4-4 and 4-5.

Seasonality Effects

Only a few coefficients for seasonality effects were statistically significant in the overall analysis. Seasonal consumption patterns did not seem to play an important role in changing the market shares among the flower retail outlets. Interestingly, other calender occasions such as Boss's Day, Secretary's Day, and Thanksgiving had significant impacts on the supermarkets' shares in the second income group in both within and across income group estimates. In addition, seasonality was significant for arrangements, which were the highest priced floral products. This implies that decisions to select retail outlets when buying arrangements were affected more by the buying occasions.

Behavioral Effects

Lastly, behavioral variables associated with buying flowers were evaluated in terms of their impact on flower expenditures among different retail outlets. Behavioral variables were divided into two groups: reasons behind buying flowers for self consumption and reasons behind buying flowers for gifts to others. As shown in Tables 6-6 and 6-7, reasons behind buying flowers for self consumption were significant largely for households with income of more than $25,000 a year. In addition, many of the significant coefficients were highest for the expensive flower products such as arrangements (Table D-18 in Appendix D). Also, there were higher numbers of significant coefficients for florists than for supermarkets. This indicates that households made more deliberate decisions in buying expensive items at expensive outlets such as florists than in buying relatively less expensive items in supermarkets.

Reasons behind buying flowers for gifts to others were significant in fewer numbers. As shown in Table 6-8, generally the significant coefficients were either for income group 2 or higher income groups. In most cases the significant coefficients showed up for florists, again it was likely that households made more deliberate decisions in buying flowers from florists than from supermarkets.

In this chapter the overall statistical properties of the outlet share models were reviewed and reported across several classifications. These models gave the empirical basis for providing more insight into the major factors of interest, i.e., pricing, income, and promotions. In the next two chapters these factors are explained in greater detail by using the elasticities calculated from the estimated parameters and various simulation techniques. Specifically, a range of prices, expenditures, and promotions are considered and illustrated graphically. For the promotions, the relative impacts of generic versus brand advertising are fully explored. In calculating elasticities and undertaking simulations the parameter estimates from the within income models are used. The first reason for selecting this model is that at the overall fresh-cut flower level both within and across models have similar results including significance levels and magnitude of coefficients. Secondly, the tests of model stability showed that some of the models for across income groups failed stability tests (Table D-23 in Appendix D).

CHAPTER 7
DEMAND AND MARKET SHARE ELASTICITIES, AND SIMULATIONS

Introduction

Before evaluating the impact of promotions on flower retail outlets, examining whether the empirical results are consistent with fundamental economic theory is necessary. In Chapter 6 only a general discussion of parameters was carried out including an overview of the statistically significant estimates. Since the AIDS model in the full form is nonlinear in the parameters, the actual signs of the slopes of the function could not be determined directly by visually inspecting individual price parameters. Elasticities of demand with respect to own prices, cross prices and expenditures can provide information regarding not only the signs of the demand slopes but also the economic relationship among the retail outlets. One of the objectives of the study was to analyze the economic nature of retail outlets selling overall fresh-cut flowers and three other types of fresh-cut flowers across four U.S. regions. This chapter focuses on accomplishing this objective using demand elasticities and simulations over price and income. In addition, the impacts of change in relative prices and total household expenditures on flowers on the market shares of the outlets are evaluated. The first section of the chapter describes different types of elasticities that can give a measure of price sensitivity across retail outlets selling fresh-cut flowers. Price elasticities of outlets for overall fresh-cut flowers, three types of fresh-cut flowers, and across four U.S. regions are then discussed. The third section includes expenditure elasticities. Market share elasticities of fresh-cut flowers with respect to changes in price and expenditures are then reported and discussed. Finally, outlet share simulations with respect to changes in the prices of fresh-cut flowers at the outlets and total household expenditures allocated to fresh-cut flowers are presented. Note that all the elasticities discussed in this text were calculated in the absence of any seasonality. Earlier in the study it was indicated that the objective of the generic advertising of flowers through PromoFlor was to enhance the demand for fresh-cut flowers in the regular periods of consumption. Therefore, analyses in this chapter and the following chapter on promotions focus on elasticities and simulations during the regular consumption periods or periods of non-special occasions.

Demand and Market Share Elasticities

As discussed in Chapter 5, three types of demand elasticities were computed for three types of retail outlets selling overall fresh-cut flowers, three types of fresh-cut flowers, and for four U.S. regions. Price elasticities measure the sensitivity of demand for flowers sold at specific retail outlets with respect to changes in the prices at the outlets. Both uncompensated and compensated price elasticities were computed. Compensated price elasticities are net of income effects, hence they provide more accurate information to evaluate theoretical consistency of the estimated parameters. Price elasticities as well as all other elasticities were computed for the four income groups separately from the within group parameter estimates as discussed in Chapter 6. It was expected that there were some differences in price elasticities across income groups. Particularly, retail outlets selling flowers to lower income groups were expected to have higher price elasticities than those serving higher income groups. Change in the amount of total household expenditures allocated to fresh-cut flowers may also have affected the allocation among the three types of outlets. Households belonging to higher income groups were expected to show less change in how they allocated their expenditures among the three outlets. Households belonging to lower income groups, however, may have reallocated their total expenditures on fresh-cut flowers among the outlets as their total expenditures changed. For example, households with lower income may have switched from supermarkets to florists when they had higher level of expenditures for fresh-cut flowers as a result of increased total expenditures.

Market share elasticities measure the impact of prices and expenditures on outlet shares. The information provided by market share elasticities has to be consistent with the information provided by price and income elasticities.

Demand Elasticities of Outlets with Respect to Price

Overall fresh-cut flowers

Table 7-1 and 7-2 show uncompensated and compensated price elasticities for overall fresh-cut flowers. Both types of price elasticities were computed for all four income groups. Standard errors for computed elasticities are reported in the parentheses and evaluated at the means of the model variables. These standard errors were based on the variance-covariance matrix of the original parameters. As reported in the tables many of the computed elasticities were highly significant. Many parameters relating to demographic variables used in computing elasticities were insignificant as shown in Chapter 6. However, the key parameters relating to prices and income were sufficiently significant to produce elasticities that were highly significant. The elasticity signs were consistent for all outlets and own price compensated elasticities were negative in signs. For the overall fresh-cut flowers all three outlets were substitutes for each others. As expected, elasticities for florists in the higher income groups, and particularly in income group 4 (income more than $75,000) were less elastic than in the lower income groups. That is, low income households were more sensitive to price changes at florists than higher income households. Interestingly, middle income groups (income between $25,000 and $75,000) were more sensitive to price changes at supermarkets and other outlets than income groups 1(income less than $25,000) and 4 (income more than $75,000). The middle income households were the threshold groups who could shift to florists from supermarkets and others as the price changed. If the prices for floral products were relatively high at supermarkets and other outlets, households in the middle income groups were likely to switch to florists who charged higher price but also provided more services. Among the three types of outlets florists had the lowest own price elasticities. This was also consistent with the expectation because households bought flowers at the florists more for their services and reputations than for prices.

Table 7-1: Uncompensated price elasticity of demand for retail outlets for fresh-cut flowers.

Uncompensated Price Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Florists (own price) ε_{11}	-0.86812*	-0.85665*	-0.99124*	-0.83840*
	(0.05196)	(0.02556)	(0.04386)	(0.03922)
Supermarkets/Florists (cross price) ε_{21}	-0.15768	-0.17445*	-0.15915	-0.24395*
	(0.09691)	(0.06567)	(0.12812)	(0.06780)
Others/Florists/ (cross price) ε_{31}	-0.35303	-0.49849*	0.14921	-0.29375*
	(0.18889)	(0.08459)	(0.18318)	(0.10209)
Supermarkets (own) ε_{22}	-0.56362*	-0.77799*	-0.58444*	-0.61256*
	(0.09611)	(0.07329)	(0.10869)	(0.07987)
Florists/Supermarkets (cross price) ε_{12}	-0.04883*	-0.06831*	-0.08907*	-0.10378*
	(0.02814)	(0.02198)	(0.02533)	(0.02228)
Others/Supermarkets (cross price) ε_{32}	-0.32191*	0.02628	-0.00897	-0.01741
	(0.08164)	(0.06616)	(0.09531)	(0.04972)
Others (own) ε_{33}	-0.48799*	-0.55181*	-0.79930*	-0.58146*
	(0.11882)	(0.06991)	(0.11853)	(0.08283)
Florists/Others (cross price) ε_{13}	-0.05560	-0.09305*	-0.03014	-0.12784*
	(0.02960)	(0.01662)	(0.02339)	(0.02874)
Supermarkets/Others (cross price) ε_{23}	-0.23685*	0.03132	-0.02187	-0.01556
	(0.05413)	(0.04225)	(0.06837)	(0.04963)

Note: Numbers in parentheses are standard errors; * Indicates statistically significant at 5 percent.

Another interesting comparison is among the outlets across the income groups using cross price elasticities. As stated above, households treated florists and supermarkets as substitutes outlets. However, the cross price elasticity was higher for florists than for supermarkets. When florists increased prices, more households bought at supermarkets than vice versa. However, when comparing across income groups, the cross price elasticities decreased with higher income levels. That means the switching between florists and supermarkets were less likely among the higher income households.

Table 7-2: Compensated price elasticity of demand for retail outlets for fresh-cut flowers.

Compensated Price Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Florists (own price) ε'_{11}	-0.23448*	-0.16560*	-0.19352*	-0.16879*
	(0.03797)	(0.02496)	(0.03565)	(0.03379)
Supermarkets/Florists (cross price) ε'_{21}	0.46659*	0.45083*	0.39073*	0.30179*
	(0.08372)	(0.06448)	(0.10685)	(0,06796)
Others/Florists/ (cross price) ε'_{31}	0.40465*	0.19663*	0.62266*	0.26485*
	(0.11746)	(0.07367)	(0.13153)	(0.08157)
Supermarkets (own) ε'_{22}	-0.38168*	-0.59949*	-0.46451*	-0.45863*
	(0.08704)	(0.06425)	(0.10204)	(0.07377)
Florists/Supermarkets (cross price) ε'_{12}	0.13584*	0.12897*	0.08491*	0.08508*
	(0.02425)	(0.01815)	(0.02361)	(0.01920)
Others/Supermarkets (cross price) ε'_{32}	-0.10108	0.22472*	0.09429	0.14014*
	(0.06501)	(0.05673)	(0.08651)	(0.04207)
Others (own) ε'_{33}	-0.30357*	-0.42136*	-0.71695*	-0.40499*
	(0.11652)	(0.62864)	(0.11907)	(0.07559)
Florists/Others (cross price) ε'_{13}	0.09863*	0.03663*	0.10861	0.08371*
	(0.02859)	(0.01412)	(0.02312)	(0.02579)
Supermarkets/Others (cross price) ε'_{23}	-0.08491	0.14867*	0.07378	0.15685*
	(0.05438)	(0.03801)	(0.06863)	(0.04746)

Note: Numbers in parentheses are standard errors; *Indicates statistically significant at 5 percent.

Differences among outlets across U.S. regions and types of fresh-cut flowers

Although the main focus of the study was on overall fresh-cut flowers, demand elasticities of retail outlets across the four U.S. regions and types of flowers were also calculated and reported in Appendix E. The relative magnitude of elasticities followed the same pattern as the overall fresh-cut flowers. That is, for all income groups florists were the least price elastic while supermarkets were the most price elastic. Also, cross elasticities between florists and supermarkets were generally higher than that between florists and other outlets. That is, florists and supermarkets being substitutes most of the effects of changes in prices at the florists seemed to be spilling onto the supermarkets. There were, however, some regional differences in terms of the magnitude of elasticities across income groups. For example, region 2 which included states in central regions had generally higher own price elasticities for supermarkets compared to other regions, particularly for the highest income groups. Similarly, supermarkets in region 3 were generally less price elastic.

Some conclusions can also be drawn by comparing product-wise compensated elasticities across income (Appendix D). First, the relative value of the product determined the magnitude of price elasticities. For example, arrangements, which were the most expensive items in all three outlets, had the highest magnitude of own-price elasticity in the least expensive outlet, i.e., supermarkets. That means if supermarkets increased the price of arrangements they were likely to lose more of their business compared to florists and other outlets. And their lost transactions were exclusively absorbed by florists. This is consistent with our previous discussion which showed that household ranked florists high for services and not for prices they charged. In contrast to arrangements, items like single stems were less price sensitive across all outlets. Supermarkets had the lowest own-price elasticity for single stems compared to the rest of the products across all income groups. Secondly, similar to overall fresh-cut flowers, florists were least price elastic and supermarkets were most price elastic across all fresh-cut flower types and income groups. Although florists and supermarkets were substitutes, the cross effects of price changes by supermarkets were relatively larger on florists than the reverse.

Expenditure Elasticities of Demand

Expenditure elasticities measured the percentage change in the demand for retail outlets for fresh-cut flowers as the household expenditures allocated for fresh-cut flowers change. In other words, it was the measure of how the households distributed their marginal expenditures among the retail outlets for fresh-cut flowers. One would have expected florists to have a higher expenditure elasticity because as the households became more affluent they were less sensitive to prices and more concerned about services and prestige. The calculated expenditure elasticities for overall fresh-cut flowers (Table 7-3) were consistent with this general expectation.

Table 7-3: Expenditure elasticities using the AIDS model.

Income elasticities:	**Income Group : 1 (Under \$25,000)**	**Income Group : 2 (\$25,000-\$49,999)**	**Income Group : 3 (\$50,000-\$74,999)**	**Income Group : 4 (Over \$75,000)**
Overall fresh-cut flowers:				
Florists η_1	0.97254*	1.01801*	1.11045*	1.07001*
	(0.05810)	(0.03798)	(0.03938)	(0.04655)
Supermarkets η_2	0.95815*	0.92112*	0.76545*	0.87206*
	(0.11061)	(0.09658)	(0.12503)	(0.07962)
Others η_3	1.16293*	1.02402*	0.65906*	0.89261*
	(0.22327)	(0.12661)	(0.17842)	(0.12570)

Note: Numbers in parentheses are standard errors; *Indicates statistically significant at 5 percent.

For overall fresh-cut flowers generally florists had the highest expenditure elasticities while supermarkets had the lowest. This result was consistent across the four U.S. regions and three types of fresh-cut flowers (Table E-5 in Appendix E). In comparing across the income groups for florists, households under income group 3 had generally the highest expenditure elasticity while households under income group 1 had the lowest. In contrast to that for supermarkets, households in the lowest income group had the highest expenditure elasticities. Hence, low income households allocated a higher portion of their marginal expenditure on fresh-cut flowers to supermarkets than florists.

One should keep in mind in evaluating the above expenditure elasticity results that the models were already separated into four income groups. Hence, the fluctuation in elasticities within each income group was expected to be narrow.

Market Share Elasticities

Market share elasticities reported the impact of price and expenditure changes on the market share directly without going through the demand characteristics. The results have to be consistent with the demand elasticities explained above. Market share elasticities with respect to price and expenditures for all three outlets were estimated for overall fresh-cut flowers (Table 7-4). Market share elasticities for fresh-cut flowers across the U.S. regions and types are reported in Table E-6 to E-12 in Appendix E.

Price share elasticities of outlets for overall fresh-cut flowers

Price share elasticities measured the change in market shares of the three outlets when prices at one or more of the outlets changed. For example, as shown Table 7-4 when florists increased their price they actually increased their market share of the total expenditures because the resulting decrease in demand for florists did not offset the increase in the total revenue through price increases. Similar changes in market shares occurred for supermarkets and other outlets. It was because the elasticities of demand for all outlets were less than one or also defined as being inelastic. However, the relative impacts on shares were different due to different magnitude of the elasticities. For example, because florists were the most price inelastic, changes in their market shares due to price adjustments were also the lowest while those for the supermarkets were the highest as they had the highest price elasticities.

Table 7-4: Market share elasticities of outlets with respect to price and expenditures for overall fresh-cut flowers.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group :2 ($25,000 to $49,999)**	**Income Group :3 ($50,000 to $74,999)**	**Income Group :2 (Over $75,000)**
Price Share elasticities:				
Florists (own price)	0.13188* (0.05196)	0.14335* (0.02556)	0.00876 (0.04385)	0.16160* (0.03921)
Supermarkets/Florists (cross price)	-0.15768* (0.08380)	-0.17445* (0.04314)	0.00208 (0.06437)	-0.24395* (0.05685)
Others/Florists (cross price)	0.02579 (0.09291)	0.03110 (0.04355)	-0.01084 (0.09563)	0.08234* (0.02720)
Supermarkets (own)	0.43638* (0.09611)	0.22201* (0.07329)	0.41556* (0.10869)	0.38744* (0.07987)
Florists/Supermarkets(cross price)	-0.04883 (0.02814)	-0.06831* (0.02198)	-0.08907* (0.02533)	-0.10378* (0.02228)
Others/Supermarkets (cross price)	-0.38756* (0.07729)	-0.15370* (0.05629)	-0.32649* (0.09053)	-0.28367* (0.06475)
Others (own)	0.29245* (0.05306)	0.06173 (0.03444)	0.05200 (0.06034)	0.14340* (0.04575)
Florists/Others (cross price)	-0.05560 (0.02960)	-0.09305* (0.01663)	-0.03014 (0.02339)	-0.12784* (0.02874)
Supermarkets/Others(cross price)	-0.23685* (0.05413)	0.03132 (0.04225)	-0.02187 (0.06837)	-0.01556 (0.04963)
Expenditure Share Elasticities:				
Florists	-0.02746 (0.05810)	0.01801 (0.03798)	0.11045* (0.03938)	0.07001 (0.04656)
Supermarkets	-0.04185 (0.11061)	-0.07888 (0.09658)	-0.23455* (0.12503)	-0.12794 (0.07962)
Others	0.16293 (0.22327)	0.02402 (0.12660)	-0.34094* (0.17843)	-0.10739 (0.12570)

Note: Numbers in parentheses are standard errors; * Indicates statistically significant at 5 percent.

Another interesting dimension relates to cross elasticities. The gains in florists market shares due to their increase in price mostly came from the loss in market shares for supermarkets. In contrast, the gain in market shares for supermarkets due to their price increase came mostly from other outlets. Market share analyses were further carried out using simulation analysis and reported in the following sections, which demonstrated the change in market shares for all the outlets across income groups as the prices and expenditures were changed.

Expenditure share elasticities of outlets for overall fresh-cut flowers

Among higher income groups, households allocated additional expenditures on fresh-cut flowers to florists. That is, as households became wealthier they tended to purchase more from florists than from supermarkets. Estimated expenditure share elasticities for lower income groups are generally insignificant (Table 7-4).

Effects of Price and Expenditure Change on Market Shares of Outlets

Price and expenditure simulations were carried out to show the impact of changes in prices and expenditures on market shares of florists and supermarkets. Demand curves of both florists and supermarkets were also derived using price simulations. Prices and expenditures were adjusted from their mean values to obtain 20 data points while holding all other variables at their mean levels. Supermarket prices were adjusted by increments of five cents while florist prices were adjusted by increments of eight cents. In Chapter 3 it was discussed that the value of raw flowers included in an arrangement was about 65 percent of the price of arrangements sold at florists. Hence, if both supermarket and florist prices were adjusted at the value of raw flowers created by outlets then florist prices had to be adjusted by additional three cents, reflecting the added markup more common to florists. Price simulations were first carried out to show the demand curves of both florists and supermarkets for four income groups and secondly, to illustrate the impact of price changes on market shares of florists and supermarkets. The impact of change in expenditures on market shares of florists and supermarkets was then estimated by adjusting the mean monthly expenditures on fresh-cut flowers by one million dollars increments.

Simulated Demand Curves of Florists and Supermarkets

Figure 7-1 and 7-2 show estimated household demand curves of florists and supermarkets respectively for four income groups. Aggregate demand curves for each income group were estimated using the adjusted prices and quantity demanded. Aggregate quantity demanded by each income group for an outlet was calculated by multiplying each share amount by total expenditures and then dividing by the prices at the outlets as shown in the following equations:

$$Q_i = w_i * \frac{X}{p_i} \tag{7.1}$$

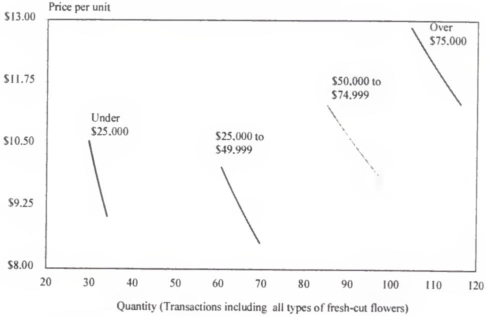
$$Q_i = \frac{p_i * Q_i}{X} * \frac{X}{p_i} \tag{7.2}$$

where Q_i is the quantity demanded at an outlet i, p_i is the price at outlet i, w_i is the estimated amount of market share using equations 5.1 and 5.2, and X is the total expenditure on fresh-cut flowers by an income group.

As discussed in Chapter 3 the number of households in each income group who actually bought flowers varied. Per capita quantity of fresh-cut flowers demanded by households in each income group was calculated by dividing Q_i in equation 7.2 by the average number of households for each income group.

Note in Figure 7-1 that the demand curves for the highest income group is at the highest level followed by the next highest group and so on. In case of aggregate demand the order may be different. As discussed in Chapter 3, the highest income group with only 8 percent of the total number of households constituted about 19 percent of total expenditures on fresh-cut flowers. Hence, the per capita expenditures on fresh-cut flowers by the highest income were the highest. Consistent with theory all the demand curves were downward sloping as shown in Figure 7-1 and also indicated by the signs of own price elasticities above. All the demand curves were relatively inelastic. However, the elasticities differed among income groups. The demand curves of outlets selling fresh-cut flowers were inelastic as is consistent with the nature of goods and services. Fresh-cut flowers are more attached to social traditions, thus less responsive to price changes. Also, expenditure elasticities of close to one and more than one (Table 7-3) indicate that fresh-cut flower outlets were more close to being luxury goods. As seen for both types of outlets, demand levels followed the income levels. Also, the highest income group experienced the highest prices at the florists. Florists not only sold fresh-cut flowers but also sold services, decorations, and prestige. Essentially fresh-cut flowers sold through florists were differentiated products. The degree of differentiation was determined by the kind of services and prestige desired by households in each income group. The average prices indicated that the highest income group households bought the most differentiated products and paid the highest prices for them. Note that prices were not much different between the first and second lowest income groups. The mean nominal price of florists for the income group under $25,000 was $9.76 which was slightly higher than the mean price of $9.25 for the income group between $25,000 and $49,999(Table 5-2). Both income groups seemed to be facing the same level of prices, although the quantity demanded for the later group was higher at each price. In case of supermarkets, price levels for all four income groups were largely the same. Supermarkets were essentially selling generic products compared to florists, hence prices did not

I. Household Demand Curves of Florists for Fresh-Cut Flowers



II. Household Demand Curves of Supermarkets Fresh-Cut Flowers

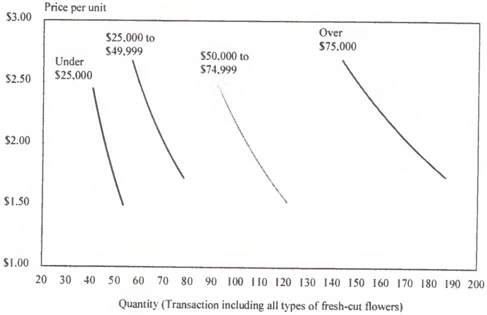
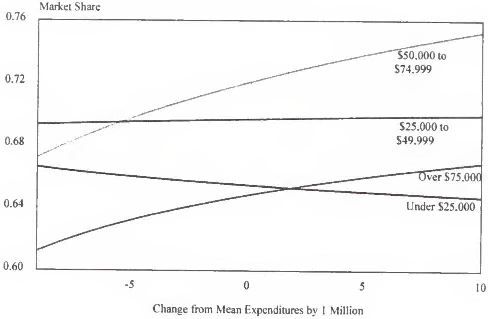


Figure 7-1: Simulated demand curves of florists and supermarkets for fresh-cut flowers.

I. Impact of Change in Expenditures on Florist Share



II. Impact of Change in Expenditures on Supermarket Share among all Income Groups

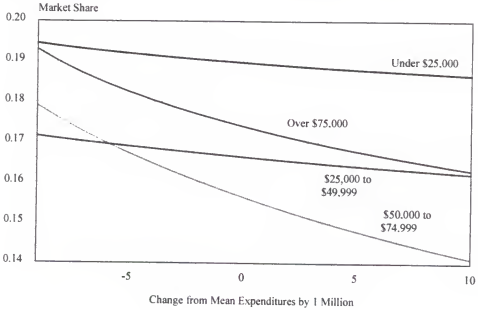


Figure 7-2: Impact of change in expenditures on market shares of florists and supermarkets.

show large differences across the income groups. Also, demand curves of supermarkets were relatively more elastic compared to florists as was initially shown in Table 7-2. This is consistent with the discussion above that more buyers bought fresh-cut flowers at supermarkets because of lower flower prices than found among florists. Hence, consumers using supermarkets were more price sensitive than those buying through florists.

Expenditure Changes and Market Shares

Figure 7-2 simulated the impact of change in expenditures on fresh-cut flowers on market shares for florists and supermarkets. Models above were estimated with the initial assumption that the expenditures allocated to the outlets for fresh-cut flowers were fixed and the variables included in the models explained the reallocation of fixed expenditures among the three outlets. Simulations can be used to show how the additional expenditures on fresh-cut flowers would be allocated among the outlets. The market share curves in Figure 7-2 indicated that most of the additional expenditures on fresh-cut flowers went to florists among income groups $50,000 and above. Market shares of florists in the remaining groups with income less than $50,000 did not change significantly. The next section in Figure 7-2 indicated that all the market shares gained by florists in two income groups were largely at the cost to supermarkets. As shown in the figure, as expenditure levels were increased supermarket shares in the two highest income groups declined significantly. Supermarkets also lost some market shares in the remaining two income groups to the other type of outlets.

Price Changes and Market Shares

Figure 7-3 to 7-12 show simulation results with respect to changes in prices at florists and supermarkets. Each figure has two sections. The first section relates to market share changes due to own price changes and the section relates to cross price effects. Price simulations were carried out by changing florists prices while first keeping other two prices and other variables at their mean values. Secondly, supermarket prices were changed keeping other variables at their mean values. Finally, both the florists and the supermarket prices were changed keeping other variables at their mean values. Both florists and supermarkets gained market shares when they increased their prices. This result is consistent with the estimated elasticities of outlets. Since all fresh-cut flower outlets were generally price inelastic, the proportionate change in quantity demanded was less than increases in price. Hence, each outlet experienced net revenue gains leading to an increase in market shares at the cost to the other outlets.

In case of florists, changes in market shares due to own price changes were much less significant compared to supermarkets. The maximum change in market shares for florists was one and half percentage points in income group $25,000 to $49,000 compared to about four percentage points for supermarkets in the income group under $25,000. Also, supermarkets experienced big changes with higher income groups (see Figures 7-9 and 7-10).

Figure 7-11 and 7-12 show changes in market shares of florists and supermarkets when both florist and supermarket prices were adjusted. The bottom axis in all the figures indicates cents per unit increased or decreased from mean prices in both outlets. For example, the maximum decrease was 45 cents at supermarkets and 72 cents at florists. It is interesting that when both florist and supermarket prices were changed, shifts in market shares were more significant for supermarkets than for florists. In lower income groups supermarkets gained market shares while florists did not experience much change in their market shares. However, in higher income groups supermarkets gained shares while florists lost.

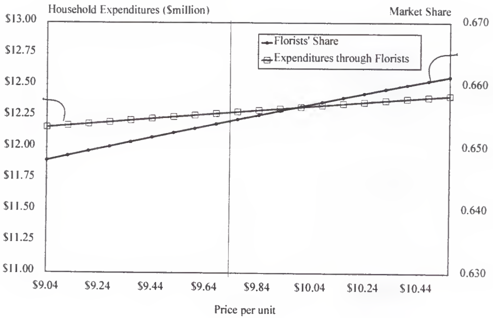
This chapter uncovered key economic characteristics of retail outlets for fresh-cut flowers, which mainly addressed the first research hypothesis discussed in Chapter 1. First, demand curves for florists and supermarkets in all income groups were negatively sloped and relatively inelastic. However, price elasticities generally differed among income groups depending on the type of outlet. Outlets dealing with lower income groups had higher price elasticities than that for the higher income groups.

In general cross price elasticities were fairly small in magnitude among the retail outlets. Supermarkets and other outlets were generally substitutes for florists, while supermarkets and other outlets were complements to each other. The inferences using own price elasticities and cross price elasticities in the four U.S. regions and across types of fresh-cut flowers were largely similar to those for overall fresh-cut flowers.

Florists had higher expenditure elasticities among the three outlets for all the income groups except for the lowest income group. As people became wealthier, they tended to purchase flowers from florists. Lowest income households, however, allocated a higher proportion of their additional expenditures on flowers through supermarkets.

Market share elasticities were consistent with price and income elasticities. All three outlets increased their revenue if their prices were raised keeping prices of other two types of outlets constant. This result is not surprising because flower outlets have inelastic demand. The price simulations showed that florists gained market shares by increasing price at the cost to supermarkets and vice versa.

I. Impact of Changes in Florist's Price on Florist Share



II. Impact of Changes in Florist's Price on Supermarket Share

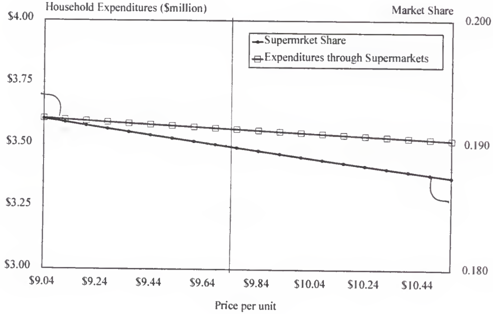
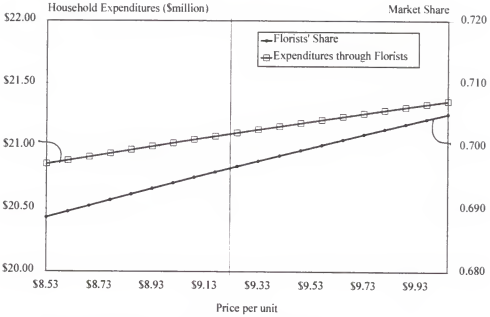


Figure 7-3: Impact of change in florist price on market shares of florists and supermarkets for income group (under $25,000).

I. Impact of Changes in Florist's Price onFlorist Share



II. Impact of Changes in Florist's Price onSupermarket Share

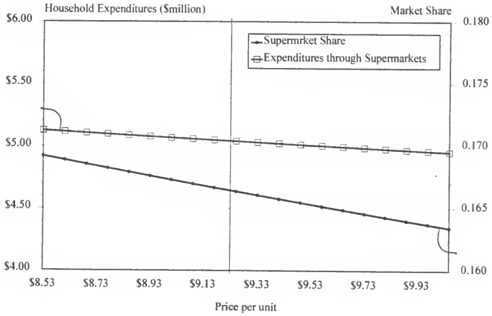
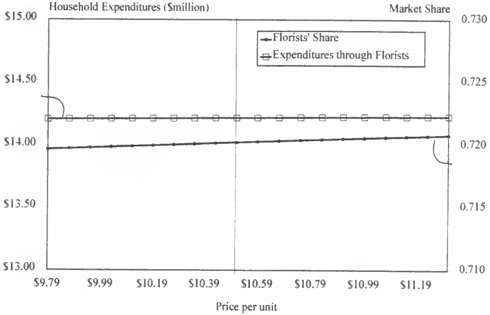


Figure 7-4: Impact of change in florist price on market shares of florists and supermarkets for income group ($25,000 to $49,999).

I. Impact of Changes in Florist's Price on Florist Share



II. Impact of Changes in Florist's Price on Supermarket Share

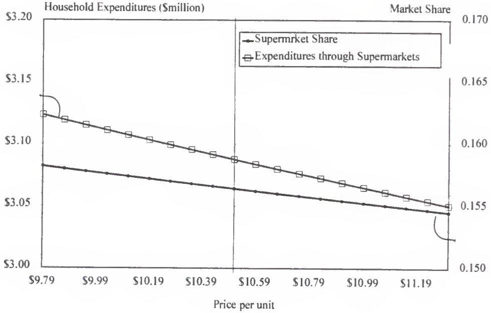
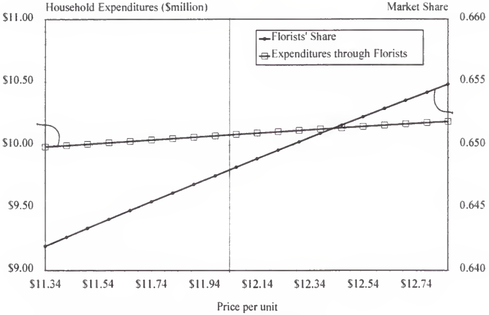


Figure 7-5: Impact of change in florist price on market shares of florists and supermarkets for income group ($50,000 to $74,999).

I. Impact of Changes in Florist's Price onFlorist Share



II. Impact of Changes in Florist's Price on Supermarket Share

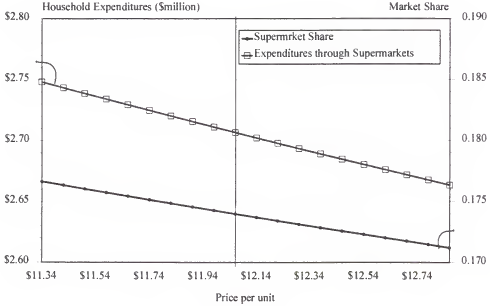
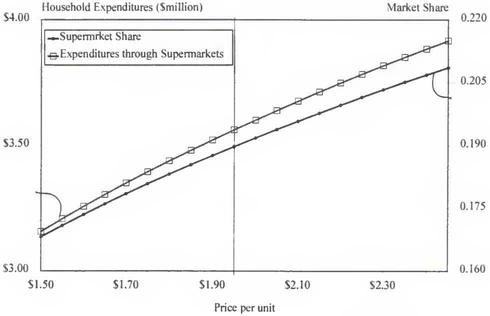


Figure 7-6: Impact of change in florist price on market shares of florists and supermarkets for income group (Over $75,000).

I. Impact of Changes in Supermarket Price onSupermarket Share



II. Impact of Changes in Supermarket Price onFlorist Share

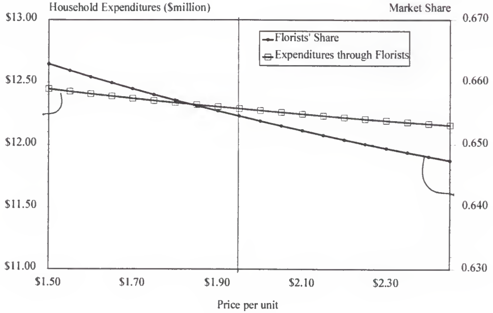
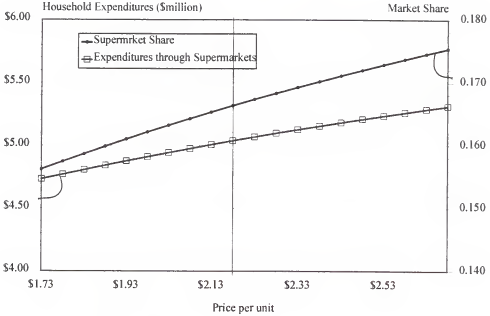


Figure 7-7: Impact of change in supermarket price on market shares of supermarkets and florists for income group (under $25,000).

I. Impact of Changes in Supermarket Price onSupermarket Share



II. Impact of Changes in Supermarket Price onFlorist Share

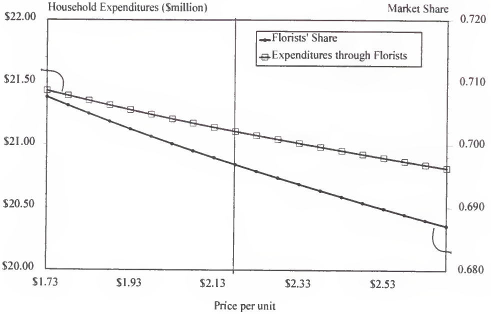
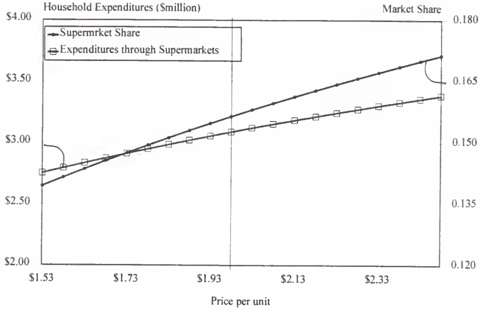


Figure 7-8: Impact of change in supermarket price on market shares of supermarkets and florists for income group ($25,000 to $49,999).

I. Impact of Changes in Supermarket Price onSupermarket Share



II. Impact of Changes in Supermarket Price onFlorist Share

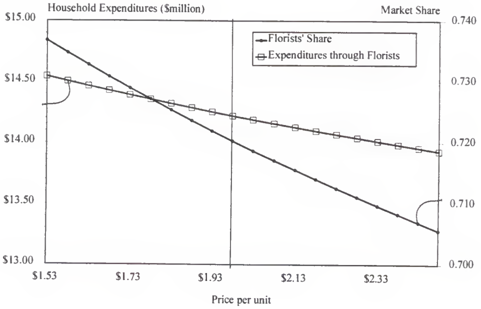
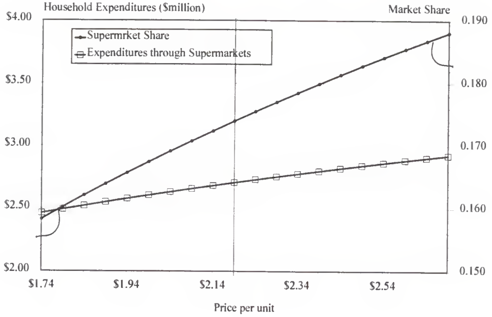


Figure 7-9: Impact of change in supermarket price on market shares of supermarkets and florists for income group ($50,000 to $74,999).

I. Impact of Changes in Supermarket Price onSupermarket Share



II. Impact of Changes in Supermarket Price onFlorist Share

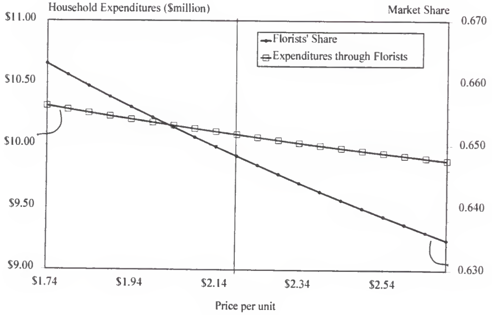
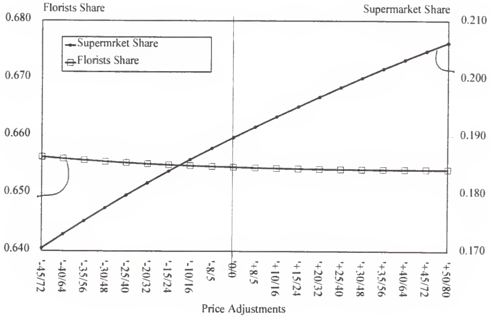


Figure 7-10: Impact of change in supermarket price on market shares of supermarkets and florists for income group (Over $75,000).

I. Impact of Change in both prices on Supermarket andFlorists Share (Under $25,000)



II. Impact of Change in both prices on Supermarket and Florists Share($25,000 to $49,999)

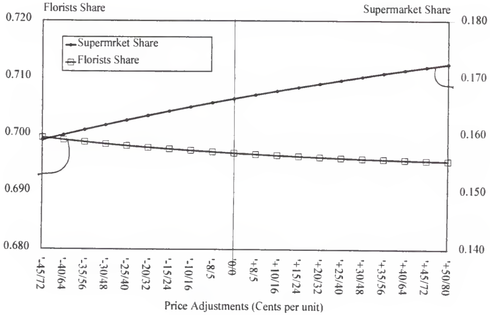
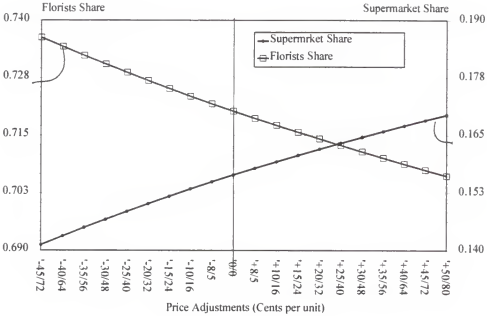


Figure 7-11: Impact in change in both florist and supermarket prices on market shares.

I. Impact of Change in both prices on Supermarket and Florists Share ($50.000 to $74.999)



II. Impact of Change in both prices on Supermarket and Florists Share (over $75.000)

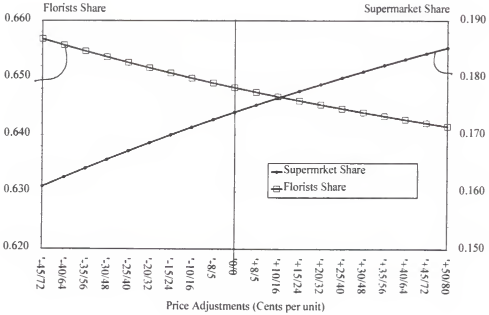


Figure 7-12: Impact in change in both florist and supermarket prices on market shares.

CHAPTER 8
PROMOTION ELASTICITIES AND PROMOTION SIMULATIONS

Introduction

The issue of outlet neutrality of advertising becomes critical for industries that spend substantial amounts on both brand and generic advertising. As discussed in Chapter 3, until PromFlor was withdrawn in 1997 both generic and brand advertising were simultaneously affecting the fresh-cut flower and green industry. Such dual advertising is not unique to the fresh-cut flower industry. Florida's orange juice industry is another example that has both types of advertising at the same time. Previous studies in generic advertising recognized simultaneous existence of brand and generic advertising in an industry. However, those studies concentrated on evaluating the impact of generic advertising on the industry demand. The issue of brand and outlet neutrality of both generic and brand advertising has been addressed using empirical models. In the context of the fresh-cut flower industry, the question is whether the generic advertising (PromFlor) or brand advertising reallocated market shares among the three types of retail outlets for fresh-cut flowers. Two key hypotheses regarding the effect of promotions on market shares of retail outlets for fresh-cut flowers as discussed in Chapter 1 are: a) since generic promotions are designed to be outlet neutral there should not be a significant impact on the market shares among retail outlets; and b) brand promotions are designed to be outlet biased, thus the overall impact of brand advertising on the shares of the advertised outlets should be positive. In the case of the fresh-cut flowers and green industry, PromoFlor was designed to be outlet neutral while brand advertising such as FTD and 1-800 should be biased toward these advertised outlets. In Chapter 4 it was shown that the market share response function of a truly generic advertising is relatively flat or horizontal to the bottom axis of the diagram (Figure 4-4), while that for the brand advertising should show a positive response (Figure 4-5). Although the theoretical discussion helped to draw a set of general hypotheses regarding the impact of PromoFlor and brand promotions, empirically their impacts across the four income groups and the four U.S. regions must be tested.

In Chapter 2 several models used in evaluating the impact of generic advertising on general industry demand were reviewed. Some empirical models are based on the demand systems approach. A demand system approach is even more suitable for analyzing the impact on market shares because these models are expenditure allocation models that begin with the assumption that the total allocable expenditures on a group of goods are already fixed. If the total allocated household expenditures on fresh-cut flowers are equal to the total revenue of the fresh-cut flower industry, then share models such as the Rotterdam model, the Translog model, and the AIDS model are consistent in evaluating the variables that determine reallocation of fixed expenditures. In our case, the problem is the allocation of expenditures across outlets.

In Chapter 5 two methods of incorporating advertising in the three demand system models were discussed: scaling and translating. Scaling assumes that the effect of advertising is to increase the perceived value of a product either by lowering consumers' perception of the per-unit price or by increasing perceived product quantity. The assumption behind translating is that advertising increases the subsistence (threshold) level of the quantity consumed. In the case of fresh-cut flowers, increase in the subsistence level of flower consumption could mean the use of flowers every day instead of a few special days in a year. PromoFlor advertising actually emphasized messages about the importance of using flowers every day. If generic advertising is intended to increase or to slow the rate of decrease in the subsistence level, then translating is a suitable way to incorporate this effect. In Chapter 5 AIDS models were modified to incorporate translating effects by using demographic variables including advertising in the intercept term in the AIDS share equations. The motivation behind this modification of the AIDS model is that certain demographic features influence the base period share and, by allowing this intercept terms to vary with advertising expenditures the effects of advertising can be incorporated in the models. Share equations (Equation 5-1 and 5-2) for the three types of outlets were estimated for four income groups using seemingly unrelated regression (SUR) procedures. Market share elasticities with respect to promotions were calculated using equations 5-16 and 5-17. The elasticity results must be carefully evaluated in terms of their magnitude because an elasticity value may or may not translate into a numerically meaningful volume in terms of market shares or household expenditures for a particular outlet. This kind of impact evaluation can be best undertaken using simulations. Also, while models are estimated across income groups, a major issue is the aggregate impact of these promotion activities on the market shares among florists, supermarkets, and other outlets. To show the aggregate impact, one can show the total share change aggregated over the four income groups.

In earlier chapters household seasonal consumption patterns in the fresh-cut flower market were discussed. In Chapter 6 two ways of capturing these peculiar buying patterns in the models were suggested. The first way was to use a seasonality index as one of the independent variables or deseasonalization of the dependent variables in each model. Because flower buying occasions do not fall within any specific time interval a seasonality index based on a specific time interval such as monthly or quarterly may not capture all of the buying occasions. The second method of capturing the buying occasions in the model is by using dummy variables. Although a narrow definition of consumption occasions will require too many dummy variables, buying occasions may be broadly defined to limit the number of dummy variables. Based on this argument all the results presented above used models with two dummies. As discussed in Chapter 6, one of the dummies represented special buying occasions and the other represented other buying occasions or non-special occasions. The problem with using dummy variables is buying occasions may be correlated with the intensity of advertising. That is, during those buying occasions certain outlets tend to intensify their advertising efforts. For example, FTD advertising and 1-800 Flowers are more frequent during Valentine Day and Mothers Day. Due to this potential correlation the impact of brand advertising may be understated. Simulation analysis will be carried out to examine the effect of using dummy variables on the advertising impacts.

The first section of this chapter discusses elasticities of market share for three types of retail outlets with respect to generic and brand promotions. Elasticities over the four U.S. regions are also calculated and discussed. Then simulation analyses are used to show the impact of brand and generic promotions on the retail outlets' market shares and revenues. The difference between models using dummy variables and those using the seasonality index to accommodate special buying occasions is also simulated. Finally, key findings in the chapter are summarized and compared against the research hypotheses.

Promotion Elasticities

Promotion elasticities measure the sensitivity of market shares of retail flower outlets with respect to changes in the promotion expenditures. For example, PromoFlor elasticities are defined as the percentage changes in market shares of florists, supermarkets, and other outlets when PromoFlor expenditures are changed by one percent. Note that the total change has to be zero because we are only evaluating reallocation in market shares among the outlets over a range of promotion expenditures. The question whether PromoFlor enhanced the total market was addressed initially by Ward (1997). This study keeps the total market size unchanged and then determines if the promotions produced any reallocation of shares among three retail outlets. Although elasticity measures are unit neutral, one has to be careful in drawing conclusions based on the magnitude of the elasticity. Changes in market shares reflected with the elasticities may not translate into a meaningful dollar amount in some cases. Also, a one percent change in PromoFlor dollars can differ substantially from brand advertising since the expenditures on brand promotions are much larger than the generic promotions.

Table 8-1: Promotion elasticities of retail outlets for fresh-cut flowers.

Promotion Elasticities	**Income Group :1 (Under $25,000)**	**Income Group :2 ($25,000 to $49,999)**	**Income Group :3 ($50,000 to $74,999)**	**Income Group :4 (Over$75,000)**
PromoFlor: Florists	0.00093 (0.00850)	0.01200* (0.00482)	-0.00145 (0.00663)	0.00881 (0.01019)
PromoFlor: Supermarkets	0.02165 (0.01538)	-0.01744 (0.01230)	-0.00970 (0.02049)	0.00546 (0.01672)
PromoFlor: Others	-0.02257 (0.01445)	0.00543 (0.00918)	0.01116 (0.01716)	-0.01428 (0.01462)
Brand Advertising: Florists	0.01820 (0.02396)	0.03721* (0.01391)	0.01869 (0.01686)	0.00496 (0.02996)
Brand Advertising: Supermarkets	-0.00060 (0.04359)	-0.08961* (0.03538)	-0.00434 (0.05267)	0.08622 (0.04862)
Brand Advertising: Others	-0.01815 (0.04121)	0.05240* (0.02628)	-0.01436 (0.04437)	-0.09118* (0.04236)

Note: Numbers in parentheses are standard errors. * Indicates statistically significant at 5 percent.

Fresh-Cut Flowers Promotion Elasticities across Retail Outlets

Both generic and brand promotion elasticities for the three types of retail outlets were calculated and reported in Table 8-1. The standard errors of promotion elasticities are also reported in the parentheses. The parameter estimates and significance levels (Table 6-6) were discussed in

Chapter 6. As can be seen in Table 8-1, for overall fresh-cut flowers generic (PromoFlor) promotions significantly affected households belonging to the income group between \$25,000 and \$50,000. The results indicate that PromoFlor redistributed market shares to florists from supermarkets and other outlets in this income group. For the rest of the income groups the effects of PromoFlor on the outlets were statistically insignificant. The effects of brand advertising were positive and significant for florists. In contrast, they were negative and insignificant for supermarkets in the same income group. Brand promotions largely favored florists and other outlets by increasing their market shares at the costs of reduced market shares of other outlets and perhaps supermarkets. Brand promotions were favorable to other outlets in the highest income group also. This finding is consistent with the objectives of brand promotion activities that largely represent specialized outlets such as florists and, hence are biased toward them.

Despite being significant and outlets biased in some income groups, both brand and generic promotion might not have reallocated market shares in a significant manner when the net effects on all four groups are considered. That is, the impact seen for one income could be offset (or accentuated) by the response in another income group. The simulation analysis in the following sections will evaluate this aspect of the results.

Differences in Promotion Elasticities across U.S. Regions and Types of Flowers

Calculations of promotion elasticities of retail outlets for fresh-cut flowers in four U.S. regions are reported in Table F-1 in Appendix F. In U.S. region 1 PromoFlor was biased toward florists in income group 2 and allocated market shares to florists away from supermarkets. The brand advertising results were not statistically significant in any of the income groups in this region, although brand advertising elasticities generally had positive signs for florists and negative signs for supermarkets. In U.S. region 2 also promotion impacts were statistically significant in income group 2 only. However, contrary to U.S. region 1, in this region only brand advertising had statistically significant impacts. As expected brand advertising in U.S. region 2 were biased toward florists at the cost of supermarkets. PromoFlor did not have significant impact in this region in any of the income groups. Both generic and brand promotions impacted significantly for income group 2 in U.S. region 3. As reported in the Table F-1 in Appendix F, in this region PromoFlor was favorable to supermarkets at the cost of market shares of florists and other outlets in income group 2. Brand advertising favored florists and other outlets while negatively affecting markets shares of supermarkets. Finally, in U.S. region 4 both generic and brand promotions had statistically insignificant impacts on markets shares of all three retail outlets in all income groups except in income group 3. In this group PromoFlor had a positive impact on the market shares of supermarkets at the cost of florists' market shares. Brand advertising was favorable to florists.

Once again the results were mixed in terms of promotion effects on market shares. Similar to overall fresh-cut flowers shown in Table 8-1 the above impacts of promotion expenditures largely appeared in the middle income groups. Wherever PromoFlor effects were significant, they were generally favorable to florists, hence, indicating that in middle income groups PromoFlor may have been outlet biased. Once again, the net result on overall income groups may not be numerically important. In case of brand advertising, the expenditures clearly favored florists at the cost to supermarkets.

Generic and brand promotion elasticities of retail outlets for three types fresh-cut flowers were calculated and reported in Table F-2 in Appendix F. Significant promotion impacts appeared for more expensive fresh-cut flower products such as arrangements and bouquets/boxes/corsages. Outlets for the least expensive items (e.g., single stems) had none of the promotional impacts on their market shares. Again, most impacts were in income group 2. For example, in the case of outlets for arrangements PromoFlor had a significant negative impact on the market shares of supermarkets. For other products PromoFlor did not have significant impacts on market shares among the three outlets, which is similar to the results discussed above. Brand advertising favored florists in the case of arrangements and bouquets/ boxes/corsages at the cost of market shares of supermarkets.

Change in Promotion Expenditures and Market Shares of Outlets

General discussion on the estimates from the AIDS models (Chapter 6) and promotion elasticities above points to differences in the impact from generic advertising (PromoFlor) and brand promotions on the use of outlets. Further, the results showed differences across the four income groups with both PromoFlor and brand advertising having significant impacts on the outlet shares. Also some differences across the four U.S. regions were found in terms of the nature of the outlets (Chapter 7) shown by price and income elasticities and response to promotions in terms of promotion elasticities. It was pointed out earlier that the elasticity results must be carefully evaluated in terms of their magnitude. Because an elasticity may or may not translate into a significant volume in terms of market shares and also, household expenditures on a particular outlet. This kind of impact evaluation can be best shown using simulations.

Figures 8-1 to 8-7 in the text and Figure F-1 to F-18 in Appendix F depict the results of the simulation analyses that evaluate the impacts of changes in promotion expenditures on market shares of florists and supermarkets for overall fresh-cut flowers. Other outlets are excluded from the analysis. In each graph, the bottom axis shows changes in promotion expenditures. The mean monthly promotion ($) level for 1996 is adjusted by expressing the promotions as an index of the mean level. For example, in each figure the bottom axis shows the promotions as a percent of the mean monthly promotion expenditures in 1996 with the value of 0 reflecting the indexed expenditures with no adjustments to the promotion levels. The outlet share is on the right vertical axis and the simulated household expenditures are on the left vertical axis when both market shares and share of total household expenditures are shown. Summary charts, showing differences in the impact of PromoFlor and brand advertising on market shares of florists and supermarkets report only market shares in the left vertical axis. Such charts will provide comparison across income groups and the U.S. regions.

The first section of the simulation analysis highlights differences in PromoFlor and brand impacts on retail outlets in each of the four income groups. Evaluation of the promotion impact on all income groups will then be discussed. The next section reports the differences in results between models using a seasonality index and that using dummy variables to represent buying occasions. Finally, regional differences in terms of PromFlor and brand advertising effects on outlet use are presented.

PromoFlor and Brand Promotion Impact on Outlet Shares Across Income Group

Note that in general advertising coefficients relating to only income group $25,000 to $49,999 were statistically significant. Although simulations across all the income groups were completed to emphasize the numerical importance, this section highlights simulation for only income group $25,000 to $49,999. Promotion coefficients and elasticities (Table 6-6 and Table 8-1) were statistically significant for this group. The important conclusion that can be drawn from this simulation is that even when statistically significant in this income group, PromoFlor did not have a meaningful impact. However, as shown in Figures 8-1 brand advertising had positive impact on the market shares of florists at the cost of supermarkets. Figures 8-2 and 8-3 depict advertising impacts across income groups on the shares of florists and supermarkets. A summary of impacts is depicted in Figures 8-4 to 8-7. In each figure both PromoFlor and brand impacts are presented in the same scale of measurement to facilitate a direct comparison.

PromoFlor and brand promotion impacts on florist shares

While florists were positively affected, both PromoFlor and brand promotions had varied impacts on the share of the total market and expenditures of florists across income groups. In the lowest income group (under $25,000) market share curves as well expenditure share curves for PromoFlor were almost flat indicating a small impact on florists. However, in the same group brand promotion had a significantly positive impact on florists as shown by positively sloping share curve (Figure F-1 in Appendix F). Note that the steep slopes of the share curves did not translate into equally positive changes in the expenditure shares. The most noticeable impact is in the income group between $25,000 and $49,999 (Figure F-2 in Appendix F). The pattern of impact of both PromFlor and brand advertising on the market share of florists was almost the same in this income group. Although, the impact on market shares by brand promotion was more significant than by PromoFlor, both did not translate into large changes in dollar terms. In the third income group (Figure F-3 in Appendix F) only brand promotion positively affected florists, while PromoFlor positively affected florists in the fourth income group (Figure F-4 in Appendix). Again in all four income groups the changes in terms of dollar expenditures were quite small due to PromoFlor. Brand advertising had relatively larger impacts in the income group between $25,000 and $49,999 (Figure 8-1) with florists being favored by brand advertising at the cost to supermarkets.

PromoFlor and brand promotion impacts on supermarket shares

In the lowest income group (Figure F-5 in Appendix F) PromoFlor had a large and positive impact on shares of supermarkets more in terms of dollar expenditures than in terms of percentage. Brand promotions had almost no impact on market shares of supermarkets. In the second income group (Figure F-6 in Appendix F) the favorable impacts of PromoFlor and brand promotions on florists were mostly at the cost to supermarkets. Supermarkets showed a noticeable loss in market shares in the income group between $25,000 and $49,999. Supermarkets realized some of the gains attributed to brand promotions in the income group with over $75,000 annual income (Figure F-8 in Appendix F).

Summary graphs (Figures 8-2 and 8-3) show that both types of promotions had negligible impacts on market shares in terms of percentage and absolute dollar expenditures. However, in comparison to PromoFlor, brand promotions had a bigger impact on all income groups for both types of outlets.

Aggregate Impact of PromFlor and Brand Promotions

One of the questions was whether PromoFlor and brand promotions affected market shares of outlets in the combined income groups. As stated earlier this question can be addressed by aggregating the simulated impacts in each income group. Figures 8-4 to 8-6 report the aggregate impacts of PromoFlor and brand promotions on market shares of florists and supermarkets. In an aggregate PromoFlor had almost no impact on supermarkets and little positive impact on florists, while brand promotions had relatively greater impacts on both supermarkets and florists. Florists, in this case, gained at the cost to supermarkets. The difference in impact between PromoFlor and brand promotions can be better compared using Figure 8-6 where the market share response curve for both PromoFlor and brand promotions are shown in the same graphs. The first section of the figure relates to florists and the second section relates to supermarkets. As can be seen brand promotions increased the market shares of florists by almost three percentage points compared to only 1.5 percentage points attributed to PromoFlor. PromoFlor had virtually no impact on supermarkets for all income groups while brand had a negative impact on supermarket shares.

Dummy Variables versus Seasonality Index

Earlier it was noted that the effect of brand promotions may have been dampened due to the use of dummy variables representing consumption occasions. A simulation analysis was carried out using an alternative model that replaced dummy variables by a seasonality index based on a three month moving average. Figure 8-7 depicts the difference in impacts of brand promotions on the market share of florists and supermarkets. The use of dummy variables dampened the effects of brand promotions on market shares of florists by about 0.5 percentage points over the range of simulated expenditures by about 1.5 percentage points for supermarkets. These results implied that the effects of brand promotions were conservatively estimated and relative to PromoFlor may have had a slightly greater impact on market shares than estimated with the dummy seasonal adjustments.

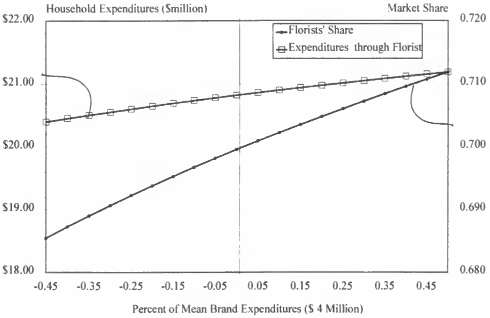
PromoFlor and Brand Promotion Impact on Outlet Shares Across U.S. Regions

Figures F-9 to F-12 in Appendix F depict the impacts of PromoFlor and brand promotions on market shares of florists for all income groups across the four U.S. regions. Figures F-13 to F-16 in Appendix F depict the same for supermarkets. Summaries of the impacts are shown with Figures F-17 and F-18 in Appendix F. In each figure both PromoFlor and brand impacts are presented in the scale measurement to allow for direct comparison. Impacts of PromoFlor and brand promotions were varied across U.S. regions for both florist and supermarket shares. Summary figures (Figures F-17 and F-18 in Appendix F) show that both PromoFlor and brand promotions had negligible impacts on market shares of florists in U.S. region 1 (North) and region 2 (Central). Changes in market shares were more noticeable in U.S. regions 3 (South) and 4 (West). While both PromoFlor and brand promotions were favorable to florists in region 4, the effects in region 3 were reversed. In region 3 PromoFlor impacts were negative for florists while brand promotion impacts were positive. In case of supermarkets, the impacts were negligible in U.S. regions 1 and 4 and noticeable in 2 and 3. Interestingly, in regions 2 and 3 both PromoFlor and brand impacts were reversed. PromoFlor affected market shares of supermarkets positively in regions 2 and 3 while brand promotions affected the same negatively.

There were minimal share changes among florists, supermarket, and others when the generic promotions were ranged from 55 percent of the mean level to 150 percent of the mean. For both outlets the share response was relatively flat, showing extremely small changes in household expenditures and the outlet shares over these expenditures. There was no evidence of any numerically important change in the shares and, therefore, one would conclude that the generic promotions of fresh-cut flowers were not outlet bias. That is, the market share curves of PromoFlor for all income groups in the overall U.S. remained flat over the range of simulated expenditures changes (Figure 8-13).

Brand advertising was expected to be outlet bias since most of the brand promotions were linked to florists and the services provided. FTD activities were a good case in point. In direct contrast to that shown for PromoFlor, florists share of the fresh-cut flower market increased in greater degree with more brand promotion efforts (Figure 8-6). While the numbers were small in absolute terms, the florists' share increased from around 67 percent to about 68 percent of the market as a direct result from increasing the brand promotions. The upper section of Figure 8-6 showed a two percentage point spread in shares over the range of promotion expenditures. The results with the lower section of Figure 8-6 indicated that most of the gains in florist shares from the brand promotions occurred at a cost of declining supermarket shares, although not totally. Clearly, the combined results from these figures pointed to the outlet neutrality of the generic efforts in the aggregate and the expected shifts in market shares attributed to the brand promotions.

I. Brand Promotion Impact on Florist Share



II. Brand Promotion Impact on Supermarket Share

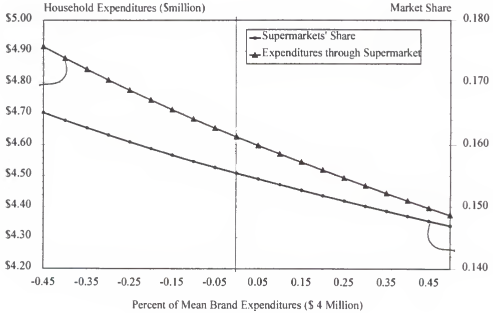
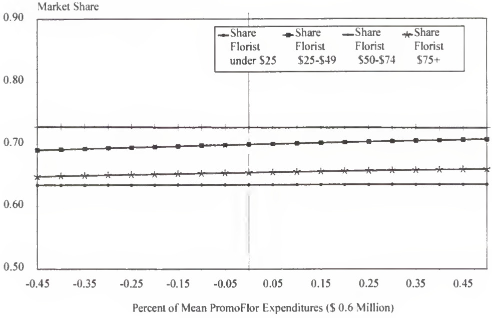


Figure 8-1:Brand promotion impacts on florist and supermarket shares among income group ($25,000 to $49,999).

I. PromoFlor Impact on Florist Shares



II. Brand Promotion Impact on Florists' Share

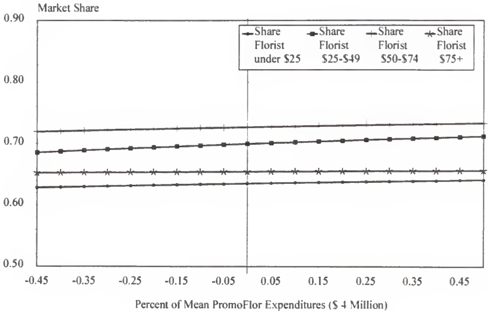
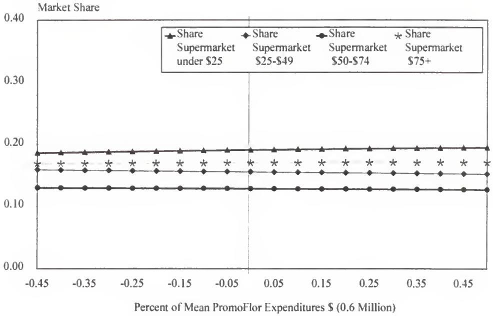


Figure 8-2: PromoFlor and brand promotion impacts on florist share among all income groups.

I. PromoFlor Impact on Supermarket Shares



II. Brand Promotion Impact on Supermarkets' Shares

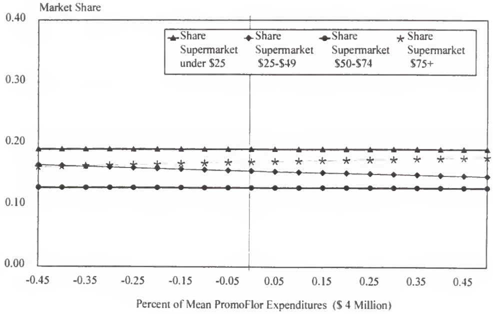
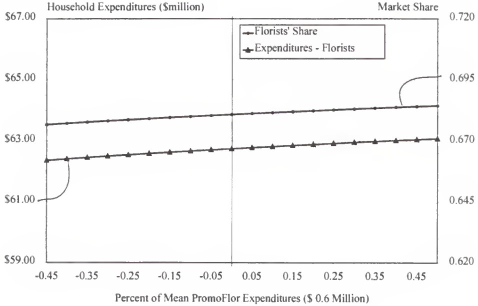


Figure 8-3: PromoFlor and brand promotion impacts on supermarket share among all income group.

I. PromoFlor Impact onFlorists Share



II. PromoFlor Impact onSupermarkets Share

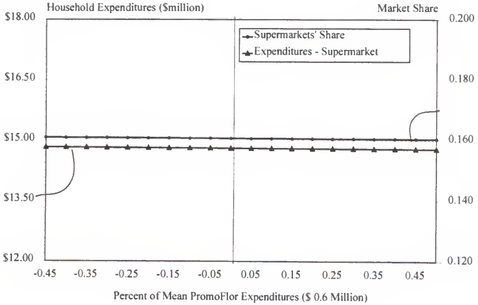
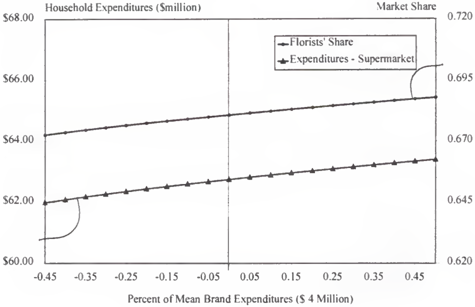


Figure 8-4: PromoFlor impact on florist and supermarket shares for overall income group.

I. Brand Promotion Impact onFloristsShare



II. Brand Promotion Impact onSupermarkets Share

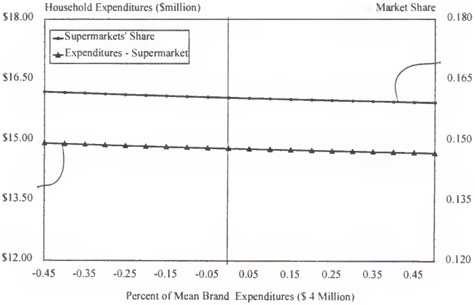
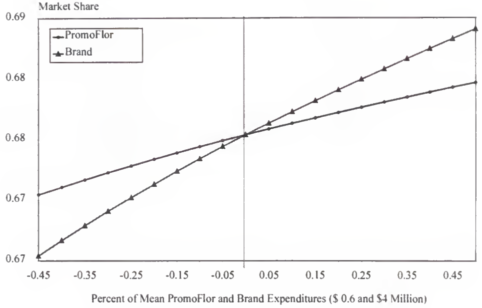


Figure 8-5: Brand promotion impact on florist and supermarket for overall income group.

I. Impact on Florist Share by PromoFlor and Brand Promotions



II. Impact on Supermarkets' Share by PromoFlor and Brand Promotions

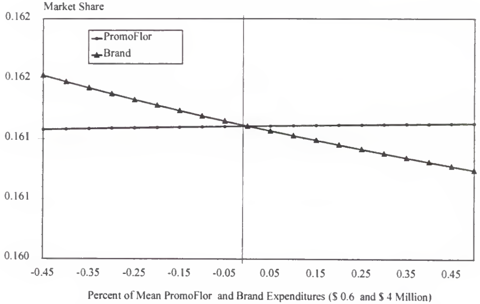
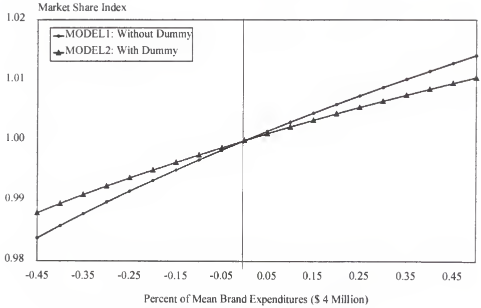


Figure 8-6: Comparing PromoFlor and brand promotion impacts on market share of florists for overall income group.


I. Brand Impacts on Florists' Share with and without Dummy Variables

II. Brand Impacts on Supermarkets with and without Dummy Variables

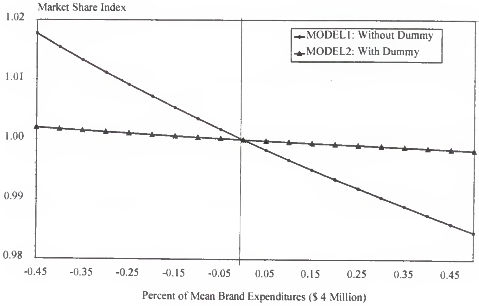


Figure 8-7: Comparing the effects of using dummy variables vs seasonality index to represent consumption occasions in terms of brand promotion impacts on market shares of florists and supermarkets for overall income group.

CHAPTER 9
SUMMARY AND CONCLUSIONS

The main objective of this chapter is to set forth several implications of the empirical analyses in the preceding chapters for the commodity promotion programs in general. The results are also useful for developing marketing strategies for the retail sector of the fresh-cut flowers and green industry. First a summary of the overall study is presented including the main findings of the study. Implications to existing as well as future commodity promotion programs will be discussed in the concluding section.

Summary

Fresh-cut flowers constituted about 52 percent of the flower retail sales with the rest being dried and artificial flowers (Ward, 1997). Flower sales vary across income groups where households with less than \$25,000 annual income (Group 1)account for 22.7 percent of the total sales; those with income from \$25,000 to \$49,000 (Group 2) contribute 35.8 percent; those with incomes ranging from \$50,000 to \$74,999 (Group 3) account for 23.4 percent; and finally the highest income group (Group 4) generates the remaining 18.1 percent of dollar sales. In terms of retail outlets for these flowers, florists average approximately 68 percent of the total retail sales of cut flowers; supermarkets contribute 18 percent; and others account for the remaining 14 percent. Uses of these outlets differ across the four income groups.

A generic promotion program for fresh-cut flowers and greens known as PromoFlor was implemented in late 1993 with advertising programs starting in 1996. The program was financed through assessments at the whole sale level. The retail outlets did not have to pay assessments directly, although assessments were transferred to retailers though the vertical marketing system. The value added at the retail level varied across the types of outlets where flowers represent around 6 percent of the final product. One of the equity issues may be tied to the potential of differential benefits at the retail level due to assessments at a single point in the vertical marketing system. This research actually addressed the second aspect of equity related to a potential bias of generic promotions toward any one of the types of retail outlets.

In June 1997 PromoFlor was terminated through a scheduled voter referendum among those flower handlers subject to the checkoff assessment. An economic evaluation of the PromoFlor (Ward, 1997) showed that the program was successful in expanding total expenditures on fresh cut flowers. While many issues can be cited that potentially contributed to the negative vote, issues centering around equity are of particular interest. Discussion about the assessment exemption level was an issue where firms with less than $750,000 in sales were exempted. Another equity issue focuses on the distribution of benefits within the fresh cut flower distribution system. While the assessments were at the handler level, there were clear benefits closer to the retail level. Did the generic promotions through PromoFlor generate sales gains equitably among the major retail outlets? That is, were the generic efforts "outlet neutral?"

Generic promotion programs are implemented for a large number of agricultural commodities in order to maintain and expand demand for those commodities. For many commodities the actual impacts of the programs have been evaluated. The focus of such evaluation has been primarily on the efficiency aspect of the programs quantified in terms of dollar value. In this regard many studies have concluded that there is a positive relationship between generic advertising and the demand for the commodities. While some commodities have not benefitted significantly from generic advertising, many generic promotion programs have been successful. Generic advertising for fresh-cut flowers, PromoFlor, was found to have a positive impact on the U.S. fresh-cut flowers and green industry with much of the impact resulting from increasing the number of households buying flowers.

Although a range of theoretical and empirical methodologies have been applied in evaluating the impact of advertising, all studies assume that advertising affects the demand for the commodities by altering the preferences of consumers. This role of advertising is depicted either directly through the utility function of consumers or indirectly through the household production models. In terms of empirical models some studies have used single equation models with various functional forms. Others have used a demand system approach to evaluate the impact of advertising. Translog, Rotterdam, and the AIDS models are the more popular demand system specifications adopted in the literature.

On one hand advertising is described to be reinforcing competitive market structure by providing information about the products, while on the other hand some authors have found a positive relationship between advertising and market concentration. Most of the studies on advertising and market shares relate to brand advertising. None of the studies have addressed the issue relating to generic advertising and outlet shares. Therefore, this research is expected to contribute to the body of knowledge by addressing this important issue relating to equity.

To address the outlet issue, data on household purchases of fresh-cut flowers through all types of outlets were used. Commercial data from NPD (National Panel Diary) Group included information on several thousand households reporting details on both the quantity and expenditures on flower purchases, outlet selection, flower type, along with a wide range of information on household profiles. Using these data, the market share for each retail outlet can be calculated and then used to determine if there is any relationship between the outlet shares and past PromoFlor's activities.

In order to deal with the role of PromoFlor's impact on outlet shares, one must first have a theoretical framework for introducing advertising into the demand/market share structure. Each consumer has a most preferred bundle of attributes and will make purchases consistent with that preferred bundle. Both generic and brand promotions may influence the mix of the preferred bundle as well as change some of the perceived attributes, in both situations impacting the demand for the advertised commodity. Furthermore, the same promotions may or may not change the market shares among those selling the good (e.g., retail outlets for fresh-cut flowers.)

While generic promotions may cause aggregate demand curve to shift upward, of equal importance is how the gains are distributed among those generating the revenues. These distributions of revenues are reflected through changes in the market shares among the different outlets for fresh-cut flowers and specifically the shares among florists, supermarkets, and other retail outlets. If generic promotion of flowers is outlet neutral, then the market shares among retail outlets remain unchanged holding other factors constant.

Now suppose that the generic advertising for cut flowers is not outlet neutral. Then generic advertising may reinforce some of the differentiating attributes of the products sold through different outlets. In this scenario, generic advertising has expanded total demand but also increased the market share for some of the retail outlets. Another alternative is that generic promotions emphasize the common attributes and thus reduce any differentiation among brands or outlets. In this case, the market share response would shift toward the horizontal promotion axis, thus, reversing some of the effects of brand advertising on market shares.

While generic advertising programs are implemented, producers of brand products simultaneously implement brand advertising in order to maintain or increase their market shares. For a predatory goods. as the expenditure level increases the market share of the advertised brand increases without any impact on the general demand for the product. Hence, at each level of brand advertising expenditure the total quantity demanded remains fixed. The advertised brand's market share of the industry revenue continues to increase up to the limits imposed by the total market. The advertising brand realizes an increasing share of the total gain. In case of cooperative goods, however, the brand advertising may have an impact on the total market demand while both types of promotion will not change market shares. For goods less than perfectly cooperative, the brand promotions may enhance the total demand for flowers but also influence market shares. Clearly flowers are not perfectly cooperative goods since the outlets can be differentiated in terms of flower quality and variety, services, images, and prestige.

The attribute bundle associated with the floral products of each type of retail outlet determines the degree of substitutability among the retail outlets. If the retail outlets are not perfect substitutes, then consumers of flowers will optimize their allocation of total flower expenditures among various retail outlets with the allocation determined by many other variables apart from prices. Hence, expenditure allocation decisions of consumers collectively determine the relative market share of the three types of retail outlets for flowers. Promotions may or may not play a role in the allocation decisions.

Theoretically, consumer demand involves choosing a combination of goods and services that best satisfy his or her wants given the income level. In many advertising studies it is assumed that consumers' knowledge about the goods and services influences preferences. It is also assumed that advertising changes the stock of knowledge, and hence preferences. If we assume that the utility function is separable and additive we can specify models that allow for optimizing at multiple stages. The assumption of separability allows bypassing each stage of optimization and concentrate strictly on the cut flowers sold through retail outlets.

There are various functional forms used in estimating demand models. Because of its theoretical consistency and flexibility, many studies on promotion and advertising use demand models employing the AIDS or linear-AIDS models.

A system of demand equations for each type of fresh-cut flower products for four income groups was estimated independently with the assumptions that error terms among the equations were related within each income group. Models were estimated using maximum likelihood procedures for seemingly unrelated regressions (SUR) and the appropriate price, income elasticities, and market share elasticities were computed.

A synthesis of the main objectives of the research, main hypotheses and general empirical findings using the data sets are presented in Table 9-1. In general, relative prices, income, seasonality, consumer attitudes, and generic and brand promotions affected expenditure allocation decisions significantly. The estimated parameters and standard errors for the AIDS outlet share models across income groups were reported. Many parameter values relating to price, income, promotion, seasonality, and behavioral effects were statistically significant at the 5 percent level for all income groups in case of overall fresh-cut flowers. Models were estimated within income groups and across income groups. The results including the magnitude of coefficients and statistical significance were largely similar for both the types of estimates. The within income group estimates were used for further analysis such as calculation of elasticities and simulations.

Factors affecting expenditure allocation among outlets for fresh-cut flowers were grouped into five categories: 1) price effects; 2) expenditure effects; 3) advertising effects; 4) seasonality effects; and 5) behavior effects. Generally, price effects were statistically significant across the income groups except for the income group between \$50,000 and \$74,999. Across U.S. regions and types of flowers price effects were significant at the lower income households than higher income implying that low income groups responded more to price changes than higher income groups.

Expenditure effects on outlets for overall fresh-cut flowers were significant in only one income group (between $50,000 and $75,000). It is likely that the aggregation of households in four income groups already accounted for much of the price effects. Both generic and brand advertising effects were generally insignificant for overall fresh-cut flowers. However, at the detail level such as type of flowers and across U.S. regions they were more significant. Seasonality in buying flowers did not affect expenditure allocation among outlets except in the lowest income group. Generally, behavioral variables were significant for households with income more than $25,000 buying expensive items such as arrangements at florists. Thus, households made more deliberate decisions to allocate expenditures when they were buying expensive items at expensive outlets.

Demand elasticities, share elasticities, and promotion elasticities were estimated along with their standard errors. Most elasticities were significant at 5 percent levels. Most demand elasticities were consistent with expectations and were plausible. The compensated own-price elasticities were all negative for all income groups. Cross price elasticities indicate that different outlets were substitutes. The expenditure elasticities showed that, except for the lowest income group, increases in the expenditures on cut flowers led to increase in purchases through florists and decrease in purchases through supermarkets and other outlets.

In relation to promotion effects, the results were mixed. Effect of PromFlor was generally insignificant across income groups. In the income group between $25,000 and $50,000 impact of PromoFlor was positive on florists and marginally significant and negative on supermarkets. The effects of brand advertising were generally positive and significant on florists negative and insignificant for supermarkets.

Estimates from the AIDS model pointed to differences in the impact from PromoFlor (generic) and brand promotions on the use of outlets. Further, the results showed differences across the four income groups with both PromoFlor and brand advertising having significant impacts on

Table 9-1: Summary of research objectives, research hypotheses, and findings.

Research Objectives	Research Hypotheses	Finding
1. To identify factors that influence the consumers' decision to allocate their expenditures on flowers among different outlets	1. Outlets are not perfect substitutes of each other. Apart from the relative prices at retail outlets, factors like seasonality, attitudes toward flowers as gifts, and generic and brand promotions affect the expenditure allocation decisions	1. Relative prices, income, seasonality, attitude, and promotions affected expenditure allocation on outlets for fresh-cut flowers
2. To identify changes in the use of retail outlets across income groups	1. The impacts of factors determining the expenditure allocation of flowers vary across income groups. For example, consumers in higher income groups are less sensitive to relative price change than those in lower income groups.	1. The statistical significance and magnitude of the effects of the variables varied across income groups, types of flowers, and U.S. regions.
3. To analyze potential effects of PromoFlor and brand promotions on relative shares of retail outlets.	1. Generic promotions are outlet neutral, implying that the impact of PromoFlor on retail outlet selection should be insignificant. 2. The impact of PromoFlor on the market shares of retail outlets may have varied across income groups and U.S. regions. 3. The overall impact of brand advertising on retail outlets selection by household consumers should be positive and significant for florists and negative and significant for supermarkets.	1. PromFlor was generally market share neutral. 2. PromoFlor had significant and positive impact of florists in the income group between $25,000 and $50,000. 3. Overall impact of brand advertising on florists was generally positive while that on supermarkets was negative. 4. Impacts of advertising on markets shares were numerically small.

the outlet shares. While the models were estimated across income groups, a major issue was the aggregate impact of these promotion activities on the market shares between florists, supermarkets, and all others. To show the aggregate impact, the share models were used to simulate changes in generic and brand promotions and to show the impact on each outlet share. That is, the total share change aggregated over the four income groups was shown.

There were minimal share changes among florists, supermarket, and others when the generic promotions were ranged from 55 percent of the mean level to 150 percent of the mean. For both outlets the share response curves were relatively flat, showing extremely small changes in household expenditures and the outlet shares of these expenditures. There was no evidence of any numerically important change in the shares and hence one would conclude that the generic promotions of fresh-cut flowers were outlet neutral. That is, the market share curves of PromoFlor for all income groups for the total U.S. remained flat over the range of simulated expenditures changes.

Brand advertising was expected to be outlet bias since most of the brand promotions are linked to florists and the services provided. FTD activities are a good case in point. In direct contrast to that shown for PromoFlor, florists share of the fresh-cut flower market increased in greater degree with more brand promotion efforts.

Implications to Commodity Promotion Programs

Research implications may be divided into three categories. First is the implication to the commodity promotion programs. The second is the implication to the cut-flower retail industry. The final implication is to the researchers evaluating the commodity promotion programs.

Ward (1997) suggested a conceptual framework that includes four broad elements of a commodity promotion program (Figure 9-1). The first implication may be related to administration as well as equity elements in the figure. As discussed above the first issue regarding equity is related to the level in the vertical marketing system at which assessments are implemented. Commodities change their physical as well as economic structure along the marketing system changes. Thus, placing assessments at only one level may in and of itself raise the issue of equity.

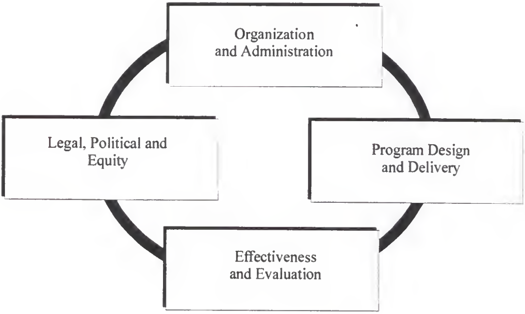

Organization and Administration
Program Design and Delivery
Effectiveness and Evaluation
Legal, Political and Equity

Figure 9-1: Elements of commodity promotion programs.

Determining the brand (or outlet) neutrality of the generic efforts has a wide range of policy implications, particularly for program restructuring. If generic promotions were truly outlet bias then an important equity issue is relating to distribution of benefits at the retail level. The results indicate that overall generic promotions were outlet neutral. However, there was evidence of biasness across income groups, particularly income between $25,000 and $49,999.

In total, the generic promotions of fresh-cut flowers simply did not reveal any numerically meaningful shifts in households use of the three broadly defined retail outlets for flowers. As indicated at the outset, PromoFlor was terminated in June, 1997 and the equity issue relating to the differences in benefits was raised. This research establishes that there was no measured equity problems when comparing the role of this generic promotion effort in terms of selecting one or more types of outlets. Clearly, there were other issues leading to the demise of PromoFlor. This analysis shows that it could not be attributed to one retail sector gaining at the costs of another. The demand graphs presented in Chapter 4 (Figures 4.4 and 4.5) and with the specific results for this industry provide an empirical reference for exploring similar issues for other commodities that are highly consumer oriented. This analysis differs from most other generic promotion evaluations in that issues beyond the aggregate demand shifts have been explored using expenditure allocation techniques. One probably cannot generalized about the neutrality of the generic advertising even though theoretically such programs should be outlet and brand neutral. Even so, this one empirical effort provides strong evidence supporting the claim of generic neutrality when it relates to brand (and outlet) selection.

The analysis is one of only a few dealing with generic and brand impacts at the same time. Further, it is unique when exploring the potential structural impact as measured with retail market shares. Brand promotions of fresh-cut flowers is by definition designed to attract consumers to the retail florist and other outlets with similar services. Clearly, the models show the brand efforts to have a significant positive impact on the selection of florist outlets. Hence, our conclusion that in Figure 4.4 the market share curve shifts down is clearly shown. While the focus of the evaluation was on this dimension or market share shift, the corresponding dollar gains accruing to that sector relative to the promotion costs was not dealt with. For completeness, one should have explored the rate-of-returns to the brand efforts. However, that issue is beyond the scope of the current work. Ward (1997) showed the brand to shift the total demand. Those conclusions along with the share shifts can be used to show the full benefits from brand advertising alone and relative to the generic. Possibly the use of the monies for this type of brand promotions is more beneficial than for the generic. Again, since PromoFlor was terminated, there is little use in comparing the generic program with ongoing brand activities. The concept is very important, however, because several generic programs have at one time or another supported joint ventures where generic funds are leveraged with brand programs to provide a more direct and strong effort. On the one hand, generic programs may shift the total demand giving a measured (or lack of) response. One must compare that response to the corresponding gains attributed to the brand efforts.

An important component to the evaluation efforts is providing a robust measure of the demand for fresh-cut flowers. The elasticities and simulated responses can be of major use to industries when exploring the implications of pricing policies. Two types of pricing policies are particularly noteworthy. First, what are the long term implications from price increases (or decreases) over a given period. This predicting dimension can provide clues to the types of pricing strategies that could benefit the industry. Such conclusions cannot be done with the knowledge of price responses (i.e., elasticities.) Secondly, the floral industry is particularly pron to making seasonal price adjustments associated with one or more special periods such as Valentines Day. Using the models and the corresponding demand curves shown in Figure 7.1 alternative pricing strategies can be explored The models show the importance of price changes and their use. Exploring the implication of different pricing strategies deserves further attention.

All models used in this study were based on aggregation of consumer household data. Without the panel data provided by NPD, such evaluation would have been impossible. Similar data bases are becoming available of other commodities and this research should provide a reference for illustrating how to deal with econometric issues and related problems associated with these types of databases. To assist, the econometric program codes have been included in the appendices so that the interested reader can see first hand how to write similar programs.

Consumer targeting is fundamentally to most marketing efforts. This analysis and that from Ward's initial study (1997) clearly points to the importance of differentiating among consumers. Recall that the households were divided along income categories and the empirical results were quite different across the four income groups. Since many of the model parameters differed among the four groups, it is important to consider using separate equations for the more important differentiating household characteristics. For flowers, the characteristics captured with incomes seem to be the most useful way. One can take the empirical results across the four income groups and simulate the kinds of changes that would be needed to achieve certain targeted growth levels within each income category. In one situation, the costs associated with stimulating a particularly group may be prohibitive while in the other is it feasible. The models in place now can be used for exploring such questions.

Econometric models in the broadest sense require care in both the development and use. The flower models were used with the expressed purpose of judging the neutrality of the generic efforts. Clearly, there is more that can be explored within the context of the existing models. However, some of the issues extend beyond the initial scope set forth for this evaluation. They will be explored in subsequent papers.

APPENDIX A
DERIVATION OF ELASTICITIES FOR THE EXPENDITURE ALLOCATION MODEL

(A-1)
$$w_{it}=\alpha_i+\sum_{j=1}^{3}\Theta_{ijt}+\sum_{i=1}^{3}\gamma_{ij}\ln p_{it}+\beta_i(\ln \mu_t-\ln P_t), \quad \forall\ i,j=1,2,3$$

(A-2)
$$\ln P_t=\sum_k(\alpha_k+\Theta_{kj})\ln p_{kt}+1/2\sum_k\sum_j \gamma_{kj}\ln p_{kt}\ln p_{jt}$$

(A-3)
$$\Theta_{i1t}=\lambda_{1i}PF_t^{0.5}+\lambda_{2i}OA_t^{0.5}$$

(A-4)
$$\Theta_{i2t}=\tau_{1i}D_1t+\tau_{2i}D_2t$$

(A-5)
$$\Theta_{i3t}=\varepsilon_{1i}SLF_{1t}+\varepsilon_{2i}SLF_{2t}+\varepsilon_{3i}GFT_{1t}+\varepsilon_{4i}GFT_{2t}$$

Substitute equation (A-2) to (A-5) in equation (A-1) to obtain:

(A-6)
$$\begin{aligned} w_{it} &= \alpha_i+\lambda_{1i}PF_t^{0.5}+\lambda_{2i}OA_t^{0.5}+\tau_{1i}D_{1t}+\tau_{2i}D_{2t} \\ &+\varepsilon_{1i}SLF_{1t}+\varepsilon_{2i}SLF_{2t}+\varepsilon_{3i}GFT_{1t}+\varepsilon_{4i}GFT_{2t}+\sum_{i=1,j=1}^{3}\gamma_{ij}\ln p_{it} \\ &+\beta_i\left(\mu-\left[\begin{array}{l}\displaystyle\sum_{k=1}^{3}\left(\begin{array}{l}\alpha_k+\lambda_{1k}PF_t^{0.5}+\lambda_{2k}OA_t^{0.5}+\tau_{1k}D_{1t}+\tau_{2k}D_{2t} \\ +\varepsilon_{1k}SLF_{1t}+\varepsilon_{2k}SLF_{2t}+\varepsilon_{3k}GFT_{1t}+\varepsilon_{4k}GFT_{2t}\end{array}\right)\ln p_{kt} \\ \displaystyle+\frac{1}{2}\sum_{k=1}^{3}\sum_{j=1}^{3}\gamma_{kj}\ln p_{kt}\ln p_{jt}\end{array}\right]\right) \end{aligned}$$

Own Price Elasticity of Demand

I. Take partial derivative of (A-6) with respect to price:

(A-7)
$$\frac{\partial w_{it}}{\partial p_i} = \frac{(\gamma_{ij} - \beta_i \Phi)}{p_i}$$

where

(A-8)
$$\Phi = \alpha_i + \lambda_{1t} PF_t^{0.5} + \lambda_{2i} OA_t^{0.5} + \tau_{1i} D_{1t} + \tau_{2i} D_{2t}$$
$$+ \varepsilon_{1i} SLF_{1t} + \varepsilon_{2i} SLF_{2t} + \varepsilon_{3i} GFT_{1t} + \varepsilon_{4i} GFT_{2t} + \sum_{i=1,j=1}^{3} \gamma_{ij} \ln p_{it}$$

II. Considering LHS of equation (A-7) and using product rule:

(A-9)
$$\frac{\partial\left(\frac{p_i q_i}{\mu}\right)}{\partial p_j}$$
$$= \left(\frac{\partial q_i}{\partial p_j} p_i + q_i\right)\frac{1}{\mu}$$
$$= \left(\frac{\partial q_i}{\partial p_j} p_i \frac{q_i}{q_i} + q_i\right)\frac{1}{\mu}$$
$$= q_i(\varepsilon_i + 1)\frac{1}{\mu} \quad \forall i = j$$

III. Multiplying (A-9) and RHS of (A-7) by p_i/w_i to obtain:

(A-10)
$$\frac{p_i q_i}{\mu}(\varepsilon_i + 1)\frac{1}{w_i} = \frac{(\gamma_{ij} - \beta_i \Phi)}{p_i}\frac{p_i}{w_i}$$

IV. Since p_iq_i/μ is w_i we obtain:

(A-11)

$$w_i(\varepsilon_i+1)\frac{1}{w_i}=\frac{(\gamma_{ij}-\beta_i\Phi)}{w_i}$$

or

(A-12)

$$(\varepsilon_i+1)=\frac{(\gamma_{ij}-\beta_i\Phi)}{w_i}$$

V. Obtain own price elasticity of demand for the AIDS model:

(A-13)

$$\varepsilon_i=\frac{(\gamma_{ij}-\beta_i\Phi)}{w_i}-1$$

Cross Price Elasticity of Demand

I. Modifying equation (A-9) for i ≠ j:

(A-14)

$$\begin{aligned}&\frac{\partial\left(\frac{p_iq_i}{\mu}\right)}{\partial p_j}\\&=\left(\frac{\partial q_i}{\partial p_j}p_i\right)\frac{1}{\mu}\\&=\left(\frac{\partial q_i}{\partial p_j}p_i\frac{q_i}{q_i}\frac{p_j}{p_j}\right)\frac{1}{\mu}\\&=\varepsilon_i\frac{p_iq_i}{\mu}\frac{1}{p_j}\quad\forall i\neq j\end{aligned}$$

II. Multiplying (A-14) and RHS of (7) by p_j/w_i to obtain:

(A-15)
$$\frac{p_i q_i}{\mu}\left(\varepsilon_j\right)\frac{p_j}{p_j w_i} = \frac{\left(\gamma_{ij}-\beta_i \Phi\right)}{p_j}\frac{p_j}{w_i}$$

III. Obtain own cross price elasticity of demand for the AIDS model:

(A-16)
$$\boxed{\varepsilon_i = \frac{\left(\gamma_{ii}-\beta_i \Phi\right)}{w_i}}$$

Income Elasticity of Demand

I. Taking partial derivative of (A-6) with respect to μ

(A-17)
$$\frac{\partial w_i}{\partial \mu} = \frac{\beta_i}{\mu}$$

II. Considering LHS of (A-17) and using quotient rule

(A-18)
$$\frac{\partial\left(\frac{p_i q_i}{\mu}\right)}{\partial \mu} = \frac{\frac{\partial\left(p_i q_i\right)}{\partial \mu}\mu - p_i q_i \frac{\partial \mu}{\partial \mu}}{\mu^2}$$

III. Using product rule on $\partial(p_i q_i)/\partial\mu$

(A-19)
$$\frac{\mu\left(\frac{\partial p_i}{\partial \mu} q_i + \frac{\partial q_i}{\partial \mu} p_i\right) - p_i q_i}{\mu^2}$$

IV. Since $\partial p_i/\partial\mu=0$

(A-20)
$$\frac{\mu\left(\frac{\partial q_i}{\partial \mu} p_i\right) - p_i q_i}{\mu^2}$$

V. Dividing (A-20) by q_i/q_i

(A-21)
$$\frac{\frac{\partial q_i}{\partial \mu} p_i \frac{q_i}{q_i} \mu - p_i q_i}{\mu^2}$$

VI. Since income elasticity, $\eta=\partial q_i/\partial\mu*\mu/q_i$

(A-22)
$$\frac{\eta_i p_i q_i - p_i q_i}{\mu^2}$$
$$= \frac{p_i q_i (\eta_i - 1)}{\mu^2}$$

VII. Since $p_i q_i/\mu=w_i$

(A-23)
$$\frac{w_i(\eta_i - 1)}{\mu}$$

VIII. Keeping LHS and RHS together:

(A-24)
$$\frac{w_i(\eta_i - 1)}{\mu} = \frac{\beta_i}{\mu}$$

and we obtain the following income elasticity of demand:

(A-25)
$$\eta_i = 1 + \frac{\beta_i}{w_i}$$

Share Elasticity with respect to price

(A-26)
$$\frac{\partial w_i}{\partial p_j}\frac{p_j}{w_i} = \frac{(\gamma_{ij} - \beta_i \Phi)}{p_j}\frac{p_j}{w_i}$$

I. Taking partial derivative of (A-6) with respect price and multiplying by p_j/w_i:

II. Manipulating (A-26) to obtain the following share elasticity with respect to price:

(A-27)
$$\delta_{ij} = \frac{(\gamma_{ij} - \beta_i \Phi)}{w_i}$$

Share Elasticity with respect to Income

I. Taking partial derivative of (A-6) with respect to μ:

(A-28)
$$\frac{\partial w_i}{\partial \mu} = \frac{\beta_i}{\mu}$$

II. Multiply (A-28) by μ/w_i:

(A-29)
$$\frac{\partial w_i}{\partial \mu}\frac{\mu}{w_i} = \frac{\beta_i}{\mu}\frac{\mu}{w_i}$$

III. Obtain the following share elasticity of demand with respect to income:

$$\eta_i^w = \frac{\beta_i}{w_i} \qquad \text{(A-30)}$$

APPENDIX B
DESCRIPTIONS OF SELECTED VARIABLES IN NPD DATA AND DESCRIPTIVE STATISTICS.

Table B-1: Descriptions of selected variables in NPD data.

Variables	Descriptions
QFRC1021	Quantity of fresh cut flowers bought at florists by households belonging to income group less than $25,000
QFRC1022	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000
QFRC1023	Quantity of fresh cut flowers bought at other outlets by households belonging to income group less than $25,000
QFRC2021	Quantity of fresh cut flowers bought at florists by households belonging to income group between $25,000 and $49,999
QFRC2022	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999
QFRC2023	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999
QFRC3021	Quantity of fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999
QFRC3022	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999
QFRC3023	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999
QFRC4021	Quantity of fresh cut flowers bought at florists by households belonging to income group more than $75,000
QFRC4022	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group more than $75,000
QFRC4023	Quantity of fresh cut flowers bought at other outlets by households belonging to income group more than $75,000
QFRC1121	Quantity of fresh cut flowers bought at florists by households belonging to income group less than $25,000 in North East and Mid Atlantic regions of U.S.
QFRC1122	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000 in North East and Mid Atlantic regions of U.S.

Variables	Descriptions
QFRC1123	Quantity of fresh cut flowers bought at other outlets by households belonging to income group less than $25,000 in North East and Mid Atlantic regions of U.S.
QFRC2121	Quantity of fresh cut flowers bought at florists by households belonging to income group between $25,000 and $49,999 in North East and Mid Atlantic regions of U.S.
QFRC2122	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999 in North East and Mid Atlantic regions of U.S.
QFRC2123	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999 in North East and Mid Atlantic regions of U.S.
QFRC3121	Quantity of fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in North East and Mid Atlantic regions of U.S.
QFRC3122	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in North East and Mid Atlantic regions of U.S.
QFRC4123	Quantity of fresh cut flowers bought at other outlets by households belonging to income group more than $75,000 in North East and Mid Atlantic regions of U.S.
QFRC4121	Quantity of fresh cut flowers bought at florists by households belonging to income group more than $75,000 in North East and Mid Atlantic regions of U.S.
QFRC4122	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group more than $75,000 in North East and Mid Atlantic regions of U.S.
QFRC4123	Quantity of fresh cut flowers bought at other outlets by households belonging to income group more than $75,000 in North East and Mid Atlantic regions of U.S.
QFRC1221	Quantity of fresh cut flowers bought at florists by households belonging to income group less than $25,000 in East North Central and West North Central regions of U.S.
QFRC1222	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000 in East North Central and West North Central regions of U.S.

Variables	Descriptions
QFRC1223	Quantity of fresh cut flowers bought at other outlets by households belonging to income group less than $25,000 in East North Central and West North Central regions of U.S.
QFRC2221	Quantity of fresh cut flowers bought at florists by households belonging to income group between $25,000 and $49,999 in East North Central and West North Central regions of U.S.
QFRC2222	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999 in East North Central and West North Central regions of U.S.
QFRC2223	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49.999 in East North Central and West North Central regions of U.S.
QFRC3221	Quantity of fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
QFRC3222	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
QFRC3223	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
QFRC4221	Quantity of fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
QFRC4222	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
QFRC4223	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
QFRC1321	Quantity of fresh cut flowers bought at florists by households belonging to income group less than $25,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.

Variables	Descriptions
QFRC1322	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC1323	Quantity of fresh cut flowers bought at other outlets by households belonging to income group less than $25,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC2321	Quantity of fresh cut flowers bought at florists by households belonging to income group between $25,000 and $49,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC2322	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC2323	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC3321	Quantity of fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC3322	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC3323	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC4321	Quantity of fresh cut flowers bought at florists by households belonging to income group over $75,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC4322	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group over $75,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
QFRC4323	Quantity of fresh cut flowers bought at other outlets by households belonging to income group over $75,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.

Variables	Descriptions
QFRC1421	Quantity of fresh cut flowers bought at florists by households belonging to income group less than $25,000 in Mountain and Pacific regions of U.S.
QFRC1422	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000 in Mountain and Pacific regions of U.S.
QFRC2422	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999 in Mountain and Pacific regions of U.S.
QFRC2423	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999 in Mountain and Pacific regions of U.S.
QFRC3421	Quantity of fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
QFRC3422	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
QFRC3423	Quantity of fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
QFRC4421	Quantity of fresh cut flowers bought at florists by households belonging to income group over $75,000 in Mountain and Pacific regions of U.S.
QFRC4422	Quantity of fresh cut flowers bought at supermarkets by households belonging to income group over $75,000 in Mountain and Pacific regions of U.S.
QFRC4423	Quantity of fresh cut flowers bought at other outlets by households belonging to income group over $75,000 in Mountain and Pacific regions of U.S.
QARR1021	Quantity of arrangements bought at florists by households belonging to income group less than $25,000
QARR1022	Quantity of arrangements bought at supermarkets by households belonging to income group less than $25,000
QARR1023	Quantity of arrangements bought at other outlets by households belonging to income group less than $25,000

Variables	Descriptions
QARR2021	Quantity of arrangements bought at florists by households belonging to income group between \$25,000 and \$49,999
QARR2022	Quantity of arrangements bought at supermarkets by households belonging to income group between \$25,000 and \$49,999
QARR2023	Quantity of arrangements bought at other outlets by households belonging to income group between \$25,000 and \$49,999
QARR3021	Quantity of arrangements bought at florists by households belonging to income group between \$50,000 and \$74,999
QARR3022	Quantity of arrangements bought at supermarkets by households belonging to income group between \$50,000 and \$74,999
QARR3023	Quantity of arrangements bought at other outlets by households belonging to income group between \$50,000 and \$74,999
QARR4021	Quantity of arrangements bought at florists by households belonging to income group more than \$75,000
QARR4022	Quantity of arrangements bought at supermarkets by households belonging to income group more than \$75,000
QARR4023	Quantity of arrangements bought at other outlets by households belonging to income group more than \$75,000
QSGC1021	Quantity of single stems bought at florists by households belonging to income group less than \$25,000
QSGC1022	Quantity of single stems bought at supermarkets by households belonging to income group less than \$25,000
QSGC1023	Quantity of single stems bought at other outlets by households belonging to income group less than \$25,000
QSGC2021	Quantity of single stems bought at florists by households belonging to income group between \$25,000 and \$49,999
QSGC2022	Quantity of single stems bought at supermarkets by households belonging to income group between \$25,000 and \$49,999
QSGC2023	Quantity of single stems bought at other outlets by households belonging to income group between \$25,000 and \$49,999
QSGC3021	Quantity of single stems bought at florists by households belonging to income group between \$50,000 and \$74,999

Variables	Descriptions
QSGC3022	Quantity of single stems bought at supermarkets by households belonging to income group between $50,000 and $74,999
QSGC3023	Quantity of single stems bought at other outlets by households belonging to income group between $50,000 and $74,999
QSGC4021	Quantity of single stems bought at florists by households belonging to income group more than $75,000
QSGC4022	Quantity of single stems bought at supermarkets by households belonging to income group more than $75,000
QSGC4023	Quantity of single stems bought at other outlets by households belonging to income group more than $75,000
QBQT1021	Quantity of bouquet/boxes/corsages bought at florists by households belonging to income group less than $25,000
QBQT1022	Quantity of bouquet/boxes/corsages bought at supermarkets by households belonging to income group less than $25,000
QBQT1023	Quantity of bouquet/boxes/corsages bought at other outlets by households belonging to income group less than $25,000
QBQT2021	Quantity of bouquet/boxes/corsages bought at florists by households belonging to income group between $25,000 and $49,999
QBQT2022	Quantity of bouquet/boxes/corsages bought at supermarkets by households belonging to income group between $25,000 and $49,999
QBQT2023	Quantity of bouquet/boxes/corsages bought at other outlets by households belonging to income group between $25,000 and $49,999
QBQT3021	Quantity of bouquet/boxes/corsages bought at florists by households belonging to income group between $50,000 and $74,999
QBQT3022	Quantity of bouquet/boxes/corsages bought at supermarkets by households belonging to income group between $50,000 and $74,999
QBQT3023	Quantity of bouquet/boxes/corsages bought at other outlets by households belonging to income group between $50,000 and $74,999
QBQT4021	Quantity of bouquet/boxes/corsages bought at florists by households belonging to income group more than $75,000
QBQT4022	Quantity of bouquet/boxes/corsages bought at supermarkets by households belonging to income group more than $75,000

Variables	Descriptions
QBQT4023	Quantity of bouquet/boxes/corsages bought at other outlets by households belonging to income group more than $75,000
EFRC1021	Expenditures on fresh cut flowers bought at florists by households belonging to income group less than $25,000
EFRC1022	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000
EFRC1023	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group less than $25,000
EFRC2021	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $25,000 and $49,999
EFRC2022	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999
EFRC2023	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999
EFRC3021	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999
EFRC3022	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999
EFRC3023	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999
EFRC4021	Expenditures on fresh cut flowers bought at florists by households belonging to income group more than $75,000
EFRC4022	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group more than $75,000
EFRC4023	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group more than $75,000
EFRC1121	Expenditures on fresh cut flowers bought at florists by households belonging to income group less than $25,000 in North East and Mid Atlantic regions of U.S.
EFRC1122	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000 in North East and Mid Atlantic regions of U.S.

Variables	Descriptions
EFRC1123	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group less than $25,000 in North East and Mid Atlantic regions of U.S.
EFRC2121	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $25,000 and $49,999 in North East and Mid Atlantic regions of U.S.
EFRC2122	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999 in North East and Mid Atlantic regions of U.S.
EFRC2123	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999 in North East and Mid Atlantic regions of U.S.
EFRC3121	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in North East and Mid Atlantic regions of U.S.
EFRC3122	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in North East and Mid Atlantic regions of U.S.
EFRC4123	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group more than $75,000 in North East and Mid Atlantic regions of U.S.
EFRC4121	Expenditures on fresh cut flowers bought at florists by households belonging to income group more than $75,000 in North East and Mid Atlantic regions of U.S.
EFRC4122	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group more than $75,000 in North East and Mid Atlantic regions of U.S.
EFRC4123	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group more than $75,000 in North East and Mid Atlantic regions of U.S.
EFRC1221	Expenditures on fresh cut flowers bought at florists by households belonging to income group less than $25,000 in East North Central and West North Central regions of U.S.
EFRC1222	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000 in East North Central and West North Central regions of U.S.

Variables	Descriptions
EFRC1223	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group less than $25,000 in East North Central and West North Central regions of U.S.
EFRC2221	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $25,000 and $49,999 in East North Central and West North Central regions of U.S.
EFRC2222	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999 in East North Central and West North Central regions of U.S.
EFRC2223	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999 in East North Central and West North Central regions of U.S.
EFRC3221	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
EFRC3222	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
EFRC3223	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
EFRC4221	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
EFRC4222	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
EFRC4223	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in East North Central and West North Central regions of U.S.
EFRC1321	Expenditures on fresh cut flowers bought at florists by households belonging to income group less than $25,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC1322	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.

Variables	Descriptions
EFRC1323	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group less than $25,000 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC2321	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $25,000 and $49,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC2322	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC2323	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC3321	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC3322	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC3323	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC4321	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC4322	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.

Variables	Descriptions
EFRC4323	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in South Atlantic, Eastern Southern Atlantic, and Western Southern Atlantic regions of U.S.
EFRC1421	Expenditures on fresh cut flowers bought at florists by households belonging to income group less than $25,000 in Mountain and Pacific regions of U.S.
EFRC1422	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group less than $25,000 in Mountain and Pacific regions of U.S.
EFRC2422	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $25,000 and $49,999 in Mountain and Pacific regions of U.S.
EFRC2423	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $25,000 and $49,999 in Mountain and Pacific regions of U.S.
EFRC3421	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
EFRC3422	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
EFRC3423	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
EFRC4421	Expenditures on fresh cut flowers bought at florists by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
EFRC4422	Expenditures on fresh cut flowers bought at supermarkets by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
EFRC4423	Expenditures on fresh cut flowers bought at other outlets by households belonging to income group between $50,000 and $74,999 in Mountain and Pacific regions of U.S.
EARR1021	Expenditures on arrangements bought at florists by households belonging to income group less than $25,000

Variables	Descriptions
EARR1022	Expenditures on arrangements bought at supermarkets by households belonging to income group less than $25,000
EARR1023	Expenditures on arrangements bought at other outlets by households belonging to income group less than $25,000
EARR2021	Expenditures on arrangements bought at florists by households belonging to income group between $25,000 and $49,999
EARR2022	Expenditures on arrangements bought at supermarkets by households belonging to income group between $25,000 and $49,999
EARR2023	Expenditures on arrangements bought at other outlets by households belonging to income group between $25,000 and $49,999
EARR3021	Expenditures on arrangements bought at florists by households belonging to income group between $50,000 and $74,999
EARR3022	Expenditures on arrangements bought at supermarkets by households belonging to income group between $50,000 and $74,999
EARR3023	Expenditures on arrangements bought at other outlets by households belonging to income group between $50,000 and $74,999
EARR4021	Expenditures on arrangements bought at florists by households belonging to income group more than $75,000
EARR4022	Expenditures on arrangements bought at supermarkets by households belonging to income group more than $75,000
EARR4023	Expenditures on arrangements bought at other outlets by households belonging to income group more than $75,000
ESGS1021	Expenditures on single stems bought at florists by households belonging to income group less than $25,000
ESGS1022	Expenditures on single stems bought at supermarkets by households belonging to income group less than $25,000
ESGS1023	Expenditures on single stems bought at other outlets by households belonging to income group less than $25,000
ESGS2021	Expenditures on single stems bought at florists by households belonging to income group between $25,000 and $49,999
ESGS2022	Expenditures on single stems bought at supermarkets by households belonging to income group between $25,000 and $49,999

Variables	Descriptions
ESGS2023	Expenditures on single stems bought at other outlets by households belonging to income group between $25,000 and $49,999
ESGS3021	Expenditures on single stems bought at florists by households belonging to income group between $50,000 and $74,999
ESGS3022	Expenditures on single stems bought at supermarkets by households belonging to income group between $50,000 and $74,999
ESGS3023	Expenditures on single stems bought at other outlets by households belonging to income group between $50,000 and $74,999
ESGS4021	Expenditures on single stems bought at florists by households belonging to income group more than $75,000
ESGS4022	Expenditures on single stems bought at supermarkets by households belonging to income group more than $75,000
ESGS4023	Expenditures on single stems bought at other outlets by households belonging to income group more than $75,000
EBQT1021	Expenditures on bouquet/boxes/corsages bought at florists by households belonging to income group less than $25,000
EBQT1022	Expenditures on bouquet/boxes/corsages bought at supermarkets by households belonging to income group less than $25,000
EBQT1023	Expenditures on bouquet/boxes/corsages bought at other outlets by households belonging to income group less than $25,000
EBQT2021	Expenditures on bouquet/boxes/corsages bought at florists by households belonging to income group between $25,000 and $49,999
EBQT2022	Expenditures on bouquet/boxes/corsages bought at supermarkets by households belonging to income group between $25,000 and $49,999
EBQT2023	Expenditures on bouquet/boxes/corsages bought at other outlets by households belonging to income group between $25,000 and $49,999
EBQT3021	Expenditures on bouquet/boxes/corsages bought at florists by households belonging to income group between $50,000 and $74,999
EBQT3022	Expenditures on bouquet/boxes/corsages t bought at supermarkets by households belonging to income group between $50,000 and $74,999
EBQT3023	Expenditures on bouquet/boxes/corsages bought at other outlets by households belonging to income group between $50,000 and $74,999

Variables	Descriptions
EBQT4021	Expenditures on bouquet/boxes/corsages bought at florists by households belonging to income group more than $75,000
EBQT4022	Expenditures on bouquet/boxes/corsages bought at supermarkets by households belonging to income group more than $75,000
EBQT4023	Expenditures on bouquet/boxes/corsages bought at other outlets by households belonging to income group more than $75,000
Main reasons for buying flowers for self :	
SFRC...201	Caught my eyes
SFRC...202	Decorate my home/garden
SFRC...203	Entertaining at my home
SFRC...204	Long lasting
SFRC...205	Makes me feel happy
SFRC...206	Reward myself
SFRC...207	Treat myself
SFRC...208	Other
Main reasons for buying flowers for giving gifts:	
GFRC...301	Colorful
GFRC...302	Communicates feelings
GFRC...303	Convenience
GFRC...304	Could not think of anything else
GFRC...305	Delivery
GFRC...306	Ideal for the person who has everything
GFRC...307	Keepsake container
GFRC...308	Like to give flowers/plants
GFRC...309	Long lasting
GFRC...3010	Makes recipient feel special
GFRC...3011	Practical

Variables	Descriptions
GFRC...3012	Price
GFRC...3013	Romantic
GFRC...3014	Traditional
GFRC...3015	Other

Table B-2: Descriptive statistics of key variables in AIDS model for cut flowers, arrangements, single stems, and bouquet/boxes/corsage.

	Income Group 1		Income Group 2		Income Group 3		Income Group 4	
	Mean	C.V.	Mean	C.V.	Mean	C.V.	Mean	C.V.
Cut Flowers								
Expenditures (million dollar)	$18.77	0.37	$30.29	0.40	$19.74	0.38	$15.55	0.42
Shares:								
Florists	65.15%	0.12	67.88%	0.10	71.84%	0.10	62.58%	0.17
Super Markets	18.99%	0.27	19.38%	0.21	15.67%	0.31	17.65%	0.31
Others	15.86%	0.51	12.74%	0.36	12.50%	0.44	19.77%	0.44
Prices (per transaction unit):								
Florists	$9.76	0.25	$9.25	0.32	$10.51	0.34	$12.06	0.41
Super Markets	$1.95	0.31	$2.18	0.28	$1.98	0.40	$2.19	0.35
Others	$2.63	0.56	$3.24	0.46	$3.31	0.41	$4.14	0.60
Arrangements								
Expenditures (million dollar)	$10.11	0.43	$16.87	0.38	$10.89	0.45	$8.55	0.49
Shares:								
Florists	83.11%	0.12	82.10%	0.09	87.52%	0.07	82.13%	0.16
Super Markets	5.92%	0.83	8.07%	0.43	5.21%	1.01	4.50%	0.88
Others	10.97%	0.93	9.83%	0.69	7.27%	0.66	13.38%	0.90
Prices (per transaction unit):								
Florists	$25.48	0.27	28.26	0.18	33.51	0.20	35.45	0.22
Super Markets	$10.62	0.36	11.88	0.28	12.34	0.46	14.99	0.48
Others	$15.74	0.68	24.39	0.45	21.77	0.53	31.07	0.57
Single Stems								
Expenditures (million dollar)	$3.15	0.51	$5.31	0.64	$3.09	0.55	$2.18	0.63
Shares:								
Florists	48.02%	0.33	54.77%	0.25	59.54%	0.25	47.27%	0.36
Super Markets	30.88%	0.40	27.44%	0.37	23.25%	0.49	28.89%	0.46
Others	21.11%	0.54	17.79%	0.54	17.21%	0.75	23.84%	0.50
Prices (per transaction unit:								
Florists	$2.43	0.36	2.04	0.32	2.10	0.34	2.12	0.53
Super Markets	$0.78	0.33	0.82	0.35	0.72	0.40	0.79	0.46
Others	$0.93	0.52	1.13	0.62	1.15	0.56	1.15	0.44
Bouquet/Boxes/Corsage								
Expenditures (million dollar)	$5.32	0.39	$7.81	0.49	$5.56	0.41	$4.68	0.42
Shares:								
Florists	40.93%	0.35	41.54%	0.36	48.34%	0.29	35.33%	0.50
Super Markets	37.95%	0.37	42.05%	0.29	32.22%	0.29	38.34%	0.38
Others	21.12%	0.55	16.41%	0.44	19.44%	0.50	26.33%	0.48
Prices (per transaction unit):								
Florists	$8.86	0.42	12.05	0.37	14.14	0.36	15.28	0.55
Super Markets	$3.69	0.26	3.31	0.24	3.12	0.31	3.70	0.27
Others	$3.91	0.45	4.23	0.44	4.29	0.41	4.80	0.42

Table B-3: Descriptive statistics of key variables in AIDS model for cut flowers in four U.S. regions.

Variables	Income Group 1		Income Group 2		Income Group 3		Income Group 4	
	Mean	C.V.	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
US Region 1								
Expenditures (million dollar)	$4.41	0.57	$7.51	0.59	$5.32	0.40	$5.14	0.48
Shares:								
Florists	61.01%	0.32	72.47%	0.15	67.51%	0.21	60.38%	0.31
Super Markets	18.41%	0.60	16.17%	0.45	16.66%	0.52	16.89%	0.51
Others	20.58%	0.82	11.36%	0.72	15.83%	0.62	22.73%	0.71
Prices (per transaction):								
Florists	9.86	0.60	9.84	0.53	10.50	0.50	12.15	0.59
Super Markets	1.88	0.57	2.09	0.44	1.51	0.47	2.35	0.40
Others	3.04	0.80	4.46	0.99	4.51	0.75	5.96	0.93
US Region 2								
Expenditures (million dollar)	$3.55	0.50	$6.88	0.45	$4.03	0.56	$2.48	0.85
Shares:								
Florists	62.82%	0.25	64.74%	0.16	72.23%	0.23	66.98%	0.35
Super Markets	23.56%	0.49	24.67%	0.34	17.96%	0.71	23.27%	0.76
Others	13.63%	0.78	10.59%	0.60	9.81%	0.88	9.76%	1.36
Prices (per transaction):								
Florists	9.19	0.52	7.34	0.50	13.09	0.58	15.71	0.81
Super Markets	1.49	0.54	1.94	0.51	1.88	0.69	1.51	0.66
Others	2.74	0.71	2.58	0.88	3.94	0.90	4.73	0.81
US Region 3								
Expenditures (million dollar)	$6.94	0.50	$10.61	0.38	$5.48	0.59	$3.97	0.62
Shares:								
Florists	67.03%	0.21	69.38%	0.16	72.58%	0.15	59.63%	0.33
Super Markets	21.22%	0.48	19.00%	0.39	18.11%	0.57	20.31%	0.60
Others	11.75%	0.94	11.62%	0.60	9.31%	0.78	20.06%	0.73
Prices (per transaction):								
Florists	14.12	0.49	13.67	0.44	14.60	0.60	21.80	0.69
Super Markets	2.44	0.39	2.57	0.34	2.66	0.57	2.60	0.49
Others	4.79	0.82	3.39	0.60	3.89	0.77	4.30	0.72
US Region 4								
Expenditures (million dollar)	$3.87	0.47	$5.27	0.56	$4.89	0.46	$3.95	0.51
Shares:								
Florists	60.43%	0.30	56.50%	0.33	70.63%	0.18	55.24%	0.36
Super Markets	19.88%	0.61	23.20%	0.44	14.22%	0.50	21.23%	0.53
Others	19.70%	0.74	20.30%	0.69	15.15%	0.77	23.53%	0.65
Prices (per transaction):								
Florists	10.34	0.60	10.33	0.57	12.29	0.61	15.41	0.79
Super Markets	3.01	0.49	3.31	0.46	3.52	0.50	3.71	0.46
Others	2.76	1.24	6.46	0.95	3.23	0.72	5.76	1.09

Table B-4: Descriptive statistics of attitude variables in AIDS model for overall U.S. and four U.S. Regions.

Attitude Variables	Income Group 1		Income Group 2		Income Group 3		Income Group 4	
	Mean	C.V.	Mean	C.V.	Mean	C.V.	Mean	C.V.
Overall US								
Gift for Self:								
Caught My Eyes	17.29	0.26	16.52	0.26	13.17	0.29	14.09	0.29
Decorate my garden/home	54.05	0.11	61.18	0.10	64.94	0.10	63.19	0.13
Makes me feel happy	5.97	0.40	4.43	0.35	4.17	0.52	4.76	0.56
Treat myself	6.47	0.36	4.65	0.40	4.52	0.57	3.61	0.58
Other	9.91	0.34	7.91	0.35	7.16	0.35	6.42	0.43
Gift to Others:								
Communicates Feelings	10.27	0.28	12.40	0.24	12.67	0.30	12.51	0.31
Like to give flowers	12.00	0.25	12.85	0.19	14.66	0.24	15.58	0.20
Romantic	17.70	0.19	19.41	0.17	18.69	0.22	19.71	0.26
Makes recipient feel special	6.17	0.63	6.83	0.56	7.33	0.52	6.59	0.58
Others	17.09	0.21	13.50	0.21	12.20	0.22	10.18	0.34
US Region 1								
Gift for Self:								
Caught My Eyes	7.91	1.38	15.01	0.80	8.21	1.13	10.91	1.24
Decorate my garden/home	38.77	0.47	40.33	0.46	42.86	0.34	53.08	0.32
Makes me feel happy	19.94	0.95	14.73	0.85	12.71	0.88	9.53	1.04
Treat myself	12.47	1.37	13.78	0.93	13.34	0.98	7.50	1.49
Other	2.90	2.49	5.06	1.65	4.16	1.69	3.61	1.84
Gift to Others:								
Communicates Feelings	12.00	0.77	16.85	0.45	17.96	0.65	15.03	0.54
Like to give flowers	19.38	0.64	12.10	0.58	13.64	0.57	16.65	0.68
Romantic	20.51	0.62	23.36	0.45	24.74	0.44	21.50	0.47
Makes recipient feel special	10.48	0.87	10.98	0.66	10.73	0.66	8.24	0.92
Others	12.90	0.78	8.11	0.66	9.34	0.92	7.31	0.84
US Region 2								
Gift for Self:								
Caught My Eyes	14.45	1.04	17.06	0.67	13.31	1.44	18.11	1.15
Decorate my garden/home	25.63	0.85	41.22	0.46	52.25	0.46	40.63	0.55
Makes me feel happy	28.55	0.73	13.69	0.81	13.25	1.24	16.34	1.21
Treat myself	15.73	1.04	10.17	0.86	6.36	1.85	8.64	1.69
Other	4.44	1.74	4.46	1.55	2.60	2.90	3.37	4.13
Gift to Others:								
Communicates Feelings	13.65	0.55	15.14	0.41	15.51	0.83	15.07	1.09
Like to give flowers	10.18	0.72	13.36	0.46	15.78	0.66	17.65	0.73
Romantic	24.15	0.48	26.63	0.33	20.68	0.53	26.60	0.89
Makes recipient feel special	11.48	0.81	10.49	0.73	11.97	1.14	10.89	1.21
Others	13.36	0.68	9.33	0.66	11.95	1.00	7.88	1.67

Note: numbers are in percentage of total responses.

Table B-4 continued.

Attitude Variables	Income Group 1		Income Group 2		Income Group 3		Income Group 4	
	Mean	C.V.	Mean	C.V.	Mean	Std Dev	Mean	Std Dev
US Region 3								
Gift for Self:								
Caught My Eyes	17.07	1.30	16.46	0.68	7.73	1.38	15.79	1.05
Decorate my garden/home	33.01	0.73	40.97	0.36	48.86	0.49	43.19	0.50
Makes me feel happy	19.05	1.15	16.34	0.68	15.02	1.09	10.74	1.25
Treat myself	11.35	1.50	9.89	0.82	9.39	1.35	10.76	1.31
Other	5.22	1.87	6.40	1.55	4.09	2.08	1.43	2.80
Gift to Others:								
Communicates Feelings	13.99	0.67	16.82	0.45	17.22	0.70	15.07	0.70
Like to give flowers	7.45	0.90	11.96	0.46	12.57	0.80	13.39	0.70
Romantic	26.64	0.35	24.79	0.30	25.63	0.47	28.04	0.46
Makes recipient feel special	13.17	0.61	12.02	0.49	11.83	0.77	12.57	0.70
Others	11.55	0.72	10.51	0.43	7.46	0.89	4.61	1.59
US Region 4								
Gift for Self:								
Caught My Eyes	19.05	1.18	20.13	0.85	11.40	1.39	7.87	1.43
Decorate my garden/home	26.78	0.91	36.50	0.56	43.17	0.48	50.14	0.42
Makes me feel happy	13.05	1.44	10.69	1.30	7.51	1.41	8.35	1.34
Treat myself	22.81	1.09	12.65	1.07	14.07	1.22	8.02	1.45
Other	7.61	2.38	4.60	1.70	4.89	1.83	6.51	1.85
Gift to Others:								
Communicates Feelings	18.23	0.62	15.21	0.54	15.71	0.55	15.35	0.77
Like to give flowers	12.07	0.94	13.20	0.64	10.92	0.79	11.27	0.79
Romantic	25.96	0.59	27.40	0.36	23.65	0.49	27.58	0.56
Makes recipient feel special	9.05	1.09	11.85	0.75	11.96	0.61	8.31	1.06
Others	11.06	0.88	6.60	0.72	8.41	1.00	8.79	1.13

Note: Numbers are in percentage of total responses.

APPENDIX C
TSP PROGRAM

```
OPTIONS MEMORY=20;
?OPTIONS LIMWARN=0;
TITLE "STUDY OF OUTLETS FOR FRESH CUT FLOWERS-SIMULATION OF AIDS
MODEL";
FREQ M;
SMPL 1992:7,1997:2;
IN 'X:\ZFLOWER\BEHAVR2"X:\ZFLOWER\REGAGG2';
READ (FORMAT=LOTUS, FILE='X:\ZFLOWER\PROMO.WK1');
?====================================;
?CHANGES TO BE MADE FOR INCOME;
?====================================;
DOT 201 202 203 204 205 206 207 208 209;
S1.=(SFRC200./SFRC200200)*100;
?PRINT S1.;
ENDDOT;
DOT 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316;
G1.=(GFRC200./GFRC200300)*100;
?PRINT G1.;
ENDDOT;

TITLE "PRINCIPLE COMPONENTS TO SELECT FEW BEHAVIORAL
VARIABLES-SELF";
TITLE "INCOME CATEGORY-TOTAL";
PRIN (NAME=SLF)  S1201 S1202 S1205 S1207 S1208;
?
TITLE "PRINCIPLE COMPONENTS TO SELECT FEW BEHAVIORAL
VARIABLES-GIFT";
TITLE "INCOME CATEGORY-TOTAL";
PRIN (NAME=GFT)  G1302 G1308 G1310 G1313 G1315;
?  REDEFINING THE VARIABLES;
?
NQ11=QFRC2021; NQ12=QFRC2022; NQ13=QFRC2023;
E11=EFRC2021/CPI; E12=EFRC2022/CPI; E13=EFRC2023/CPI;
?==================================================;
?END CHANGES;
?==================================================;
?CALCULATING PRICES?
```

```
P11=E11/NQ11; P12=E12/NQ12; P13=E13/NQ13;
?REPLACING THE MISSING VALUES AND OULIERS;
DOT P11 P12 P13;
MSD (NOPRINT) . ;
SET PP1=@MEAN(1);
.=(MISS(.)=1)*PP1+(MISS(.)=0)*.;
msd (noprint) .;
?PRINT . ;
ENDDOT;
?INCOME GROUP 0;
 MSD (NOPRINT) P11;
 SET PP1=@MEAN+2*@STDDEV; SET PP2=@MEAN-2*@STDDEV;
 DO I=1,@NOB;
 IF P11(I)>PP1; THEN; SET P11(I)=PP1;IF P11(I)<PP2; THEN; SET P11(I)=PP2;
 ENDDO; ?PRINT PP1 PP2 P11;
 MSD (NOPRINT) P12;
 SET PP1=@MEAN+2*@STDDEV; SET PP2=@MEAN-2*@STDDEV;
 DO I=1,@NOB;
 IF P12(I)>PP1; THEN; SET P12(I)=PP1;IF P12(1)<PP2; THEN; SET P12(I)=PP2;
 ENDDO;  ?PRINT PP1 PP2 P12;
 MSD (NOPRINT) P13;
 SET PP1=@MEAN+2*@STDDEV; SET PP2=@MEAN-2*@STDDEV;
 DO I=1,@NOB;
 IF P13(I)>PP1; THEN; SET P13(I)=PP1;IF P13(1)<PP2; THEN; SET P13(I)=PP2;
 ENDDO;  ?PRINT PP1 PP2 P13;
?OBTAINING NEW QUANTITY;
Q11=E11/P11; Q12=E12/P12; Q13=E13/P13;
?
?CREATING LOG OF PRICE;
?
LP11=LOG(P11); LP12=LOG(P12); LP13=LOG(P13);
ETOT100=E11+E12+E13; LX1=LOG(ETOT100);
?EXPENDITURE SHARES?
W1=E11/ETOT100; W2=E12/ETOT100; W3=E13/ETOT100;
?
?ADDING UP CONDITION;
FRML ZAD1 A3=(1-A1-A2);
FRML ZBD1 B3=(-B1-B2);
?HOMOGENIETY CONDITIONS;
FRML ZGG11 AG13=(-AG11-AG12);
FRML ZGG12 AG23=(-AG12-AG22);
FRML ZGG13 AG33=-(-AG11-AG12)-(-AG12-AG22);
?SYMMETRY;
FRML ZG11 AG11*LP11+AG12*LP12+AG13*LP13;
FRML ZG12 AG12*LP11+AG22*LP12+AG23*LP13;
FRML ZG13 AG13*LP11+AG23*LP12+AG33*LP13;
? SUBSTITUTING HOMOGENIETY INTO SYMMETRY CONDITIONS;
```

```
EQSUB ZG11 ZGG11 ZGG12 ZGG13;
EQSUB ZG12 ZGG11 ZGG12 ZGG13;
EQSUB ZG13 ZGG11 ZGG12 ZGG13;
?
?PROMOTION EXPENDITURES;
PM_ACT=PM_ACT/CPI; OT_ADV=OT_ADV/CPI;
SPM=PM_ACT**.5; SOA=OT_ADV**.5;
FRML PRM1 EE1*SPM+AR1*SOA;
FRML PRM2 EE2*SPM+AR2*SOA;
FRML PRM3 EE3*SPM+AR3*SOA;
?
?BHAVIORAL VARIABLES;
FRML BHR1 SA1*SLF1+SB1*SLF2+GA1*GFT1+GB1*GFT2;
FRML BHR2 SA2*SLF1+SB2*SLF2+GA2*GFT1+GB2*GFT2;
FRML BHR3 SA3*SLF1+SB3*SLF2+GA3*GFT1+GB3*GFT2;
?SEASONALITY INDEX;
FRML SS1 SE1*CO1+SL1*CO2;
FRML SS2 SE2*CO1+SL2*CO2;
FRML SS3 SE3*CO1+SL3*CO2;
?
?STRUCTURAL SHIFT;
FRML ZEE EE3=-EE1-EE2;
FRML ZAR AR3=-AR1-AR2;
EQSUB PRM1 ZEE ZAR; EQSUB PRM2 ZEE ZAR; EQSUB PRM3 ZEE ZAR;
FRML ZSS1 SE3=-SE1-SE2; FRML ZSS2 SL3=-SL1-SL2;
EQSUB SS1 ZSS1 ZSS2; EQSUB SS2 ZSS1 ZSS2; EQSUB SS3 ZSS1 ZSS2;
FRML ZBH1 SA3=-SA1-SA2;
FRML ZBH2 SB3=-SB1-SB2;
FRML ZBH3 GA3=-GA1-GA2;
FRML ZBH4 GB3=-GB1-GB2;
EQSUB BHR1 ZBH1 ZBH2 ZBH3 ZBH4;
EQSUB BHR2 ZBH1 ZBH2 ZBH3 ZBH4;
EQSUB BHR3 ZBH1 ZBH2 ZBH3 ZBH4;
?CREATING THE P EQUATIONS;
?
FRML PP11 ((A1+PRM1+SS1+BHR1)+(1/2)*(ZG11))*LP11; EQSUB PP11 PRM1 BHR1 SS1
ZAD1 ZG11;
FRML PP12 ((A2+PRM2+SS2+BHR2)+(1/2)*(ZG12))*LP12; EQSUB PP12 PRM2 BHR2 SS2
ZAD1 ZG12;
FRML PP13 ((A3+PRM3+SS3+BHR3)+(1/2)*(ZG13))*LP13; EQSUB PP13 PRM3 BHR3 SS3
ZAD1 ZG13;
?AVERAGE PRICE;
FRML APP1 PP11+PP12+PP13; EQSUB APP1 PP11 PP12 PP13;
?
?EXPENDITURE EQUATIONS;
FRML EQ1 W1=A1+PRM1+SS1+BHR1+ZG11+B1*(LX1-APP1); EQSUB EQ1 ZAD1 PRM1
BHR1 SS1 ZBD1 ZG11 APP1;
```

```
FRML EQ2 W2=A2+PRM2+SS2+BHR2+ZG12+B2*(LX1-APP1); EQSUB EQ2 ZAD1 PRM2
BHR2 SS2 ZBD1 ZG12 APP1;
FRML EQ3 W3=A3+PRM3+SS3+BHR3+ZG13+B3*(LX1-APP1); EQSUB EQ3 ZAD1 PRM3
BHR3 SS3 ZBD1 ZG13 APP1;

PARAM A1 A2 A3 B1 B2 B3 AG11 AG12 AG13 AG21 AG22 AG23
    AG31 AG32 AG33 EE1 EE2 EE3 AR1 AR2 AR3 SE1 SE2 SE3
    SL1 SL2 SL3 SA1 SA2 SA3 SB1 SB2 SB3 GA1 GA2 GA3 GB1 GB2 GB3;
?
?
SELECT ((W1>0) & (W2>0) & (W3>0));
?
LSQ (MAXIT=100) EQ1 EQ2;
?=============================;
?SIMULATION;
?=============================;
SMPL 1996:1,1996:12;
MSD (NOPRINT) W1 W2 W3 P11 P12 P13 LP11 LP12 LP13 ETOT100 SPM SOA S1 SLF1 SLF2
GFT1 GFT2 PM_ACT OT_ADV;
SET MEANCO1=1; SET MEANCO2=0;
?==========================================;
? PICKING 20 PERIODS FOR SIMULATING         ;
?==========================================;
SET II=10;
SET RATE=.05;
SET STYR=1998;
SET STMTH=1;
SET ENYR=1999;
SET ENMTH=8;

?SMPL STYR:ENMTH,ENYR:ENMTH;
SMPL 1998:1,1999:8;
TREND (START=1) TRR;
ADJ=(TRR-II)*RATE;

?==========================================;
? USE D TO CONTROL ON THE VARIABLE TO SIMULATE;
?==========================================;
SET D=0;
? W1 W2 W3 ;
P11 = @MEAN(4)*(1+ADJ*(D=1));
P12 = @MEAN(5)*(1+ADJ*(D=1));
P13 = @MEAN(6)*(1+ADJ*(D=1));
LP11=LOG(P11);
LP12=LOG(P12);
LP13=LOG(P13);
```

```
? LP11 = @MEAN(7)*(1+ADJ*(D=1));
? LP12 = @MEAN(8)*(1+ADJ*(D=1));
? LP13 = @MEAN(9)*(1+ADJ*(D=1));

ETOT100 = @MEAN(10)*(1+ADJ*(D=1));
LX1=LOG(ETOT100);

? SPM =@MEAN(11)*(1+ADJ*(D=1));
? SOA =@MEAN(12)*(1+ADJ*(D=1));
CO1 =   MEANCO1*(1+ADJ*(D=1));
CO2 =   MEANCO2*(1+ADJ*(D=1));
SLF1 = @MEAN(14)*(1+ADJ*(D=1));
SLF2 = @MEAN(15)*(1+ADJ*(D=1));
GFT1 = @MEAN(16)*(1+ADJ*(D=1));
GFT2=  @MEAN(17)*(1+ADJ*(D=1));

?========================================;
? SIMULATING ON PROMOFLOR               ;
?========================================;
SET D=0;
PM_ACT =@MEAN(18)*(1+ADJ*(D=1));
SPM= PM_ACT**.5;

?========================================;
? SIMULATING ON BRAND                   ;
?========================================;
SET D=1;
OT_ADV= @MEAN(19)*(1+ADJ*(D=1));
SOA=OT_ADV**.5;

GENR EQ1 SIMW1;
GENR EQ2 SIMW2;

?========================================;
? SIMULATING EXPENDITURE ADJUSTMENT     ;
?========================================;
SIMX1=SIMW1*ETOT100*149.4;
SIMX2=SIMW2*ETOT100*149.4;
PRINT @MEAN(18) ADJ PM_ACT OT_ADV SIMW1 SIMX1 SIMW2 SIMX2;
WRITE(FORMAT=LOTUS, FILE='D:/BASIM/FC210.WK1') ADJ PM_ACT OT_ADV SIMW1
SIMX1 SIMW2 SIMX2;
END;
```

APPENDIX D
PARAMETER ESTIMATES FOR THREE TYPES OF FRESH-CUT FLOWERS AND FOUR US REGIONS

Table D-1: Almost Ideal Demand Systems Results for Arrangements (within income group).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.03737	0.02226	0.06235*	0.01793	0.02270	0.02045	0.09538*	0.02041
$\gamma_{12}=\gamma_{21}$	0.00533	0.01460	-0.01416	0.01057	-0.00894	0.01437	-0.01351	0.01023
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.04270*	0.01748	-0.04819*	0.01291	-0.01375	0.01042	-0.08188*	0.01685
γ_{22}	0.00309	0.01632	0.02099*	0.01032	0.03525*	0.01235	0.01513*	0.00869
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.00843	0.00833	-0.00683	0.00569	-0.02630	0.00632	-0.00162	0.00769
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.05112*	0.01737	0.05502*	0.01153	0.04006*	0.00776	0.08350*	0.01702
Expenditure Effects								
β_1	-0.01526	0.04846	0.01007	0.03585	-0.00779	0.02787	0.01654	0.03511
β_2	0.00008	0.02487	0.00369	0.01567	0.00261	0.02343	-0.02385	0.01277
$\beta_3=-\beta_1-\beta_2$	0.01518	0.04619	-0.01376	0.02997	0.00518	0.01392	0.00731	0.03532
Seasonality: Special Calender Occasions								
τ_{11}	-0.09517	0.05157	-0.07112*	0.03682	0.08501*	0.03300	0.05605	0.06304
τ_{12}	0.07002*	0.02505	0.04019*	0.01582	-0.04473	0.02794	0.01742	0.02312
$\tau_{13}=-\tau_{11}-\tau_{12}$	0.02515	0.04980	0.03093	0.03090	-0.04027*	0.01627	-0.07346	0.06326
Seasonality: Other Calander Occasions								
τ_{21}	-0.08644*	0.04088	-0.04470*	0.02349	0.03304	0.02445	0.04025	0.04809
τ_{22}	0.06712*	0.02037	0.04431*	0.01013	-0.02127	0.02070	0.01662	0.01758
$\tau_{23}=-\tau_{21}-\tau_{22}$	0.01932	0.03952	0.00039	0.01976	-0.01177	0.01203	-0.05687	0.04794
Advertising Effects: PromoFlor								
λ_{11}	0.01008	0.01293	-0.00091	0.00908	-0.01190	0.01144	0.00776	0.01369
λ_{12}	-0.00449	0.00630	-0.00870*	0.00393	-0.01595	0.00965	-0.00285	0.00503
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.00559	0.01247	0.00961	0.00761	0.02785*	0.00564	-0.00490	0.01378
Advertising Effects: Other Advertising								
λ_{21}	0.01978*	0.00842	0.01395*	0.00579	-0.00575	0.00527	0.00179	0.00950
λ_{22}	-0.00293	0.00407	-0.00510*	0.00249	0.00761	0.00443	-0.00349	0.00357
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.01685*	0.00814	-0.00885*	0.00487	-0.00186	0.00262	0.00170	0.00950
Behavioral Effects								
ε_{11}	0.00597	0.01901	-0.04590*	0.01346	0.02385*	0.00868	-0.04651*	0.01780
ε_{12}	0.01592	0.00943	0.02477*	0.00580	-0.00240	0.00730	0.00648	0.00656
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-0.02189	0.01837	0.02113	0.01129	-0.02145*	0.00433	0.04003*	0.01791
ε_{21}	-0.00688	0.01463	-0.02694*	0.01039	-0.00724	0.00788	0.00353	0.01426
ε_{22}	-0.00336	0.00726	0.00972*	0.00445	0.00472	0.00668	-0.00961	0.00541
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.01024	0.01412	0.01722*	0.00873	0.00252	0.00398	0.00608*	0.01427
ε_{31}	0.01853	0.01880	0.06015*	0.01512	-0.00511	0.00979	0.03467*	0.01839
ε_{32}	-0.00626	0.00918	-0.02672*	0.00649	0.01128	0.00819	-0.00225	0.00680
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.01227	0.01818	-0.03344*	0.01270	-0.00617	0.00503	-0.03243*	0.01833
ε_{41}	-0.01936	0.01516	0.01157	0.00929	0.01595	0.00883	-0.00175	0.01560
ε_{42}	0.00334	0.00763	-0.00208	0.00400	-0.00701	0.00752	-0.00569	0.00578
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	0.01602	0.01454	-0.00949	0.00780	-0.00894*	0.00427	0.00744	0.01559

*Indicates statistically significant at .05 or less: Coeff.=Coefficients: S.E.=Standard Errors.

Table D-2: Almost Ideal Demand Systems Results for Bouquet/Boxes/Corsage (within income group).

Parameters	**Income Group : 1 (Under $25,000)**		**Income Group : 2 ($25,000-$49,000)**		**Income Group : 3 ($50,000-$74,000)**		**Income Group : 4 (Over $75,000)**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.15648*	0.03371	-1.19879*	0.28155	0.05030	0.05177	-0.35443*	0.12146
$\gamma_{12}=\gamma_{21}$	-0.06699	0.05199	0.96086*	0.22875	-0.01401	0.04299	0.21701*	0.08940
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.08949*	0.03725	0.23793*	0.11229	-0.03629	0.03695	0.13742	0.11368
γ_{22}	0.05143	0.09890	-0.71555*	0.20436	0.02588	0.04470	-0.06837	0.09041
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	0.01556	0.05588	-0.24531*	0.07939	-0.01187	0.02307	-0.14864*	0.05779
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.07393	0.05391	0.00738	0.03919	0.04816	0.02909	0.01122	0.07433
Expenditure Effects								
β_1	0.02549	0.05064	0.34777*	0.04249	0.08992*	0.04232	0.24972*	0.04694
β_2	-0.10631*	0.05659	-0.27838*	0.03823	-0.04930	0.03595	-0.15224*	0.05280
$\beta_3=-\beta_1-\beta_2$	0.08082*	0.04051	-0.06939*	0.02282	-0.04062	0.02762	-0.09749*	0.04230
Seasonality: Special Calender Occasions								
τ_{11}	0.08789	0.06615	-0.19817*	0.09361	-0.04111	0.06895	-0.03528	0.08245
τ_{12}	-0.02242	0.07605	0.11993	0.07504	0.01396	0.05807	0.04464	0.07804
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.06547	0.05325	0.07824	0.04263	0.02715	0.04755	-0.00935	0.06756
Seasonality: Other Calander Occasions								
τ_{21}	0.04452	0.05060	-0.16017*	0.07614	-0.11599*	0.05081	-0.12650*	0.06276
τ_{22}	-0.04379	0.05865	0.10976	0.06121	0.05522	0.04262	0.07886	0.06017
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.00073	0.04069	0.05041	0.03278	0.06077	0.03511	0.04764	0.05066
Advertising Effects: PromoFlor								
λ_{11}	0.00979	0.01807	0.00292	0.02419	-0.01400	0.02119	-0.02427	0.02244
λ_{12}	0.01354	0.02060	0.01204	0.01992	0.01535	0.01800	0.03132	0.02157
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.02333	0.01431	-0.01496	0.01082	-0.00136	0.01399	-0.00705	0.01775
Advertising Effects: Other Advertising								
λ_{21}	-0.01708	0.01115	0.06547*	0.01685	0.01328	0.01126	0.01337	0.01431
λ_{22}	0.00801	0.01295	-0.04882*	0.01362	-0.00161	0.00948	0.00472	0.01329
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	0.00907	0.00894	-0.01666*	0.00782	-0.01167	0.00777	-0.01810	0.01159
Behavioral Effects								
ε_{11}	-0.01432	0.02500	-0.05321	0.03632	-0.03592*	0.01912	-0.00468	0.02230
ε_{12}	-0.00018	0.02885	0.04324	0.02917	0.03698*	0.01630	0.03037	0.02110
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	0.01450	0.02064	0.00996	0.01664	-0.00106	0.01231	-0.02569	0.01839
ε_{21}	0.01447	0.01657	0.06650*	0.02635	-0.00185	0.01699	-0.02375	0.02031
ε_{22}	-0.02886	0.01938	-0.04451	0.02137	-0.00905	0.01432	0.01794	0.01967
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.01439	0.01338	-0.02199	0.01295	0.01090	0.01150	0.00582	0.01575
ε_{31}	0.00324	0.02492	0.08256*	0.04148	-0.01582	0.01964	-0.06068*	0.02323
ε_{32}	0.00254	0.02818	-0.06792*	0.03310	-0.00892	0.01672	0.05203*	0.02305
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.00578	0.01946	-0.01464	0.01945	0.02474	0.01338	0.00865*	0.01979
ε_{41}	-0.01534	0.01732	-0.00629	0.02585	-0.00569	0.01756	0.01118	0.02082
ε_{42}	0.00896	0.01394	0.02518	0.02061	0.00445	0.01488	0.00644	0.01995
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	0.00638	0.01432	-0.01890	0.01182	0.00124	0.01190	-0.01762	0.01738

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-3: Almost Ideal Demand Systems Results for Single Stems with Income Independence (within income group).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.18220*	0.04476	0.06524	0.06150	0.05189	0.06533	-0.02233	0.08046
$\gamma_{12}=\gamma_{21}$	-0.15353*	0.04201	0.03785	0.05490	0.03334	0.04841	0.06393	0.06151
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.02866	0.03157	-0.10309*	0.02278	-0.08523*	0.03823	-0.04160	0.04050
γ_{22}	0.16915*	0.05274	-0.01575	0.05562	0.00346	0.04901	-0.02389	0.05701
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.01562	0.03311	-0.02211	0.02199	-0.03680	0.02839	-0.04004	0.02963
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.04428	0.03666	0.12520*	0.01809	0.12202*	0.03025	0.08163*	0.02887
Expenditure Effects								
β_1	0.01332	0.04176	0.11478*	0.03118	0.11137*	0.03007	0.12239*	0.03286
β_2	-0.06664*	0.03269	-0.11569*	0.02915	-0.08435*	0.02699	-0.12907*	0.02672
$\beta_3=-\beta_1-\beta_2$	0.05332	-0.03100	0.00092	0.01968	-0.02702	0.02777	0.00668	0.02802
Seasonality: Special Calender Occasions								
τ_{11}	0.13134	0.07347	0.00500	0.05662	0.08042	0.06430	0.04572	0.08124
τ_{12}	-0.09140	0.06099	0.03822	0.05048	-0.01350	0.05618	-0.03596	0.06412
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.03994	0.05163	-0.04322	0.03363	-0.06692	0.05467	-0.00976	0.05831
Seasonality: Other Calander Occasions								
τ_{21}	0.02329	0.05536	0.05065	0.04136	0.09016	0.04699	-0.01694	0.05898
τ_{22}	0.01268	0.04552	-0.00594	0.03692	-0.03070	0.04140	-0.04119	0.04711
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.03597	0.03852	-0.04471	0.02417	-0.05946	0.03965	0.05812	0.04171
Advertising Effects: PromoFlor								
λ_{11}	-0.00131	0.02236	0.02595	0.01817	-0.01548	0.02052	-0.00446	0.02286
λ_{12}	0.00177	0.01784	-0.00769	0.01632	0.00419	0.01813	0.03436	0.01829
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.00046	0.01609	-0.01825	0.01029	0.01128	0.01750	-0.02990	0.01788
Advertising Effects: Other Advertising								
λ_{21}	0.01049	0.01204	-0.00065	0.00993	0.00670	0.01142	-0.01023	0.01369
λ_{22}	0.00140	0.00988	-0.00004	0.00884	-0.00554	0.00992	0.00956	0.01088
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.01189	0.00855	0.00069	0.00593	-0.00117	0.00970	0.00067	0.01004
Behavioral Effects								
ε_{11}	-0.01138	0.02784	0.02375	0.02426	-0.02193	0.01756	-0.02804	0.02420
ε_{12}	-0.01119	0.02268	-0.03541	0.02171	0.03277*	0.01561	0.03662*	0.01940
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	0.02257	0.01953	0.01166	0.01463	-0.01084	0.01471	-0.00858	0.01896
ε_{21}	0.00807	0.01879	0.04327*	0.01713	0.02179	0.01754	0.03572	0.01951
ε_{22}	-0.00370	0.01546	-0.03735*	0.01529	-0.00289	0.01511	-0.01195	0.01535
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	-0.00437	0.01314	-0.00592	0.00989	-0.01890	0.01472	-0.02377	0.01407
ε_{31}	0.02164	0.02511	-0.02257	0.02641	0.01314	0.01895	-0.00417	0.02602
ε_{32}	0.00925	0.02065	0.04316	0.02367	-0.02278	0.01660	-0.01019	0.02035
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.03088	0.01755	-0.02059	0.01577	0.00964	0.01609	0.01436	0.01901
ε_{41}	0.00469	0.01909	-0.01351	0.01622	0.01083	0.01729	-0.00993	0.02140
ε_{42}	0.00699	0.01571	0.01346	0.01454	-0.00582	0.01518	0.01073	0.01697
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	-0.01167	0.01326	0.00005	0.00964	-0.00500	0.01494	-0.00080	0.01507

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-4: Almost Ideal Demand Systems Results for Total Fresh Cut Flowers in Region 1 (within income group).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.15389*	0.03290	0.05128*	0.01768	-0.02468	0.09279	-0.02621	0.09747
$\gamma_{12}=\gamma_{21}$	-0.03999	0.02873	-0.01798	0.01382	0.03331	0.05933	0.00993	0.03667
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.11390*	0.02213	-0.03330*	0.00987	-0.00863	0.04342	0.01628	0.07136
γ_{22}	0.02073	0.03367	0.03184*	0.01540	-0.01928	0.04492	0.04240*	0.02215
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	0.01926	0.02673	-0.01386*	0.00767	-0.01404	0.02737	-0.05232*	0.02504
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.09464*	0.02936	0.04716*	0.00785	0.02267	0.02176	0.03604	0.05582
Expenditure Effects								
β_1	0.04368	0.03901	0.01468	0.02416	0.12454*	0.04062	0.13890*	0.04442
β_2	-0.07093*	0.02859	-0.00725	0.01636	-0.09171*	0.02530	-0.04783*	0.02393
$\beta_3=-\beta_1-\beta_2$	0.02726	0.03817	-0.00743	0.01576	-0.03283	0.02953	-0.09107*	0.03873
Seasonality: Special Calender Occasions								
τ_{11}	0.10950	0.07865	0.03696	0.04793	0.00421	0.08174	-0.00623	0.09557
τ_{12}	-0.05260	0.05887	-0.00699	0.03124	0.02379	0.05187	-0.05513	0.04852
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.05690	0.07289	-0.02997	0.03175	-0.02800	0.05186	0.06136	0.08107
Seasonality: Other Calander Occasions								
τ_{21}	0.04119	0.05838	-0.01979	0.03642	-0.05832	0.06107	-0.09138	0.07323
τ_{22}	-0.02854	0.04380	0.05440	0.02406	0.03547	0.03975	0.01306	0.03707
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.01264	0.05399	-0.03461	0.02401	0.02285	0.03783	0.07832	0.06135
Advertising Effects: PromoFlor								
λ_{11}	-0.01096	0.02073	0.04205*	0.01431	0.00723	0.02318	-0.01897	0.02596
λ_{12}	0.01719	0.01554	-0.02730*	0.00934	-0.01214	0.01450	0.00590	0.01320
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.00623	0.01786	-0.01476*	0.00947	0.00491	0.01414	0.01308	0.02148
Advertising Effects: Other Advertising								
λ_{21}	0.00262	0.01315	-0.00973	0.00741	0.00778	0.01278	0.01187	0.01589
λ_{22}	0.00015	0.00981	-0.00390	0.00485	-0.00823	0.00807	0.01027	0.00787
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.00277	0.01212	0.01363*	0.00491	0.00045	0.00815	-0.02214	0.01340
Behavioral Effects								
ε_{11}	0.02275	0.02059	0.03627*	0.01419	-0.01796	0.01986	0.01016	0.02404
ε_{12}	-0.00288	0.01545	-0.02459*	0.00923	0.02880*	0.01260	0.00244	0.01166
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-0.01987	0.01879	-0.01167*	0.00939	-0.01084	0.01284	-0.01259	0.01989
ε_{21}	0.06116*	0.02028	-0.01423	0.01337	-0.04115*	0.02157	-0.03401	0.02515
ε_{22}	-0.01467	0.01528	0.00334	0.00871	0.02057	0.01340	0.00325	0.01252
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	-0.04649*	0.01822	0.01090*	0.00887	0.02057	0.01358	0.03076	0.02065
ε_{31}	0.02051	0.02010	0.01995	0.01227	-0.01792	0.02179	-0.04184	0.02777
ε_{32}	0.00940	0.01565	-0.01782*	0.00799	0.00203	0.01369	0.01337	0.01416
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.02991	0.01847	-0.00213	0.00810	0.01589	0.01375	0.02847	0.02298
ε_{41}	-0.00124	0.02226	-0.00093	0.01351	-0.00313	0.01754	-0.05159*	0.02648
ε_{42}	-0.00177	0.01614	-0.00024	0.00898	-0.01431	0.01122	0.02567*	0.01294
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	0.00301	0.01981	0.00118	0.00893	0.01744	0.01140	0.02592	0.02203

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-5: Almost Ideal Demand Systems Results for Total Fresh Cut Flowers in Region 2 (within income group).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.08256	0.04544	-0.00017	0.05467	-0.02496	0.06328	0.02312	0.04969
$\gamma_{12}=\gamma_{21}$	-0.05168*	0.02551	0.03993	0.04702	0.02622	0.04926	0.00885	0.03287
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.03089	0.02954	-0.03977*	0.01661	-0.00126	0.01212	-0.03198	0.02549
γ_{22}	0.04380*	0.01985	-0.02456	0.04396	0.01503	0.04166	0.00824	0.02897
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	0.00788*	0.01902	-0.01537	0.01383	-0.04125*	0.01649	-0.01709	0.01814
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.02301	0.02703	0.05514*	0.00767	0.04251*	0.01034	0.04907*	0.01835
Expenditure Effects								
β_1	0.08334*	0.03507	0.10508*	0.02925	0.10484*	0.03318	0.08261*	0.03814
β_2	-0.04111	0.03004	-0.09195*	0.02692	-0.09300*	0.02459	-0.05736*	0.02744
$\beta_3=-\beta_1-\beta_2$	-0.04223	0.02857	-0.01313	0.01599	-0.01184	0.01792	-0.02524	0.02662
Seasonality: Special Calender Occasions								
τ_{11}	-0.02664	0.06550	-0.05955	0.05229	0.19330*	0.09537	0.13703	0.10242
τ_{12}	0.01678	0.04874	0.09546*	0.04653	-0.15033*	0.07166	-0.01028	0.07145
$\tau_{13}=-\tau_{11}-\tau_{12}$	0.00985	0.04989	-0.03591	0.02534	-0.04297	0.04299	-0.12675*	0.06551
Seasonality: Other Calander Occasions								
τ_{21}	0.03919	0.05179	0.00465	0.03623	0.02501	0.08139	0.04995	0.08740
τ_{22}	-0.02621	0.03768	0.02272	0.03206	-0.01850	0.06140	0.04330	0.06080
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.01298	0.03878	-0.02738	0.01710	-0.00650	0.03600	-0.09326	0.05463
Advertising Effects: PromoFlor								
λ_{11}	-0.02966	0.01857	0.00396	0.01284	-0.00150	0.02731	0.02822	0.02983
λ_{12}	0.01744	0.01375	0.00480	0.01147	0.00415	0.02056	-0.00021	0.02150
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	0.01222	0.01460	-0.00876	0.00642	-0.00265	0.01231	-0.02801	0.01918
Advertising Effects: Other Advertising								
λ_{21}	0.00750	0.01141	0.01728*	0.00813	-0.00254	0.01554	-0.00791	0.01838
λ_{22}	0.00644	0.00835	-0.01457*	0.00728	-0.00045	0.01170	-0.00950	0.01269
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.01394*	0.00860	-0.00271	0.00398	0.00299	0.00725	0.01742	0.01148
Behavioral Effects								
ε_{11}	0.01134	0.01972	-0.00971	0.01231	0.00308	0.02526	0.03259	0.30881
ε_{12}	-0.00484	0.01426	-0.00418	0.01099	-0.00066	0.01902	0.01258	0.57600
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-0.00650	0.01461	0.01389*	0.00611	-0.00242	0.01120	-0.04517*	0.02026
ε_{21}	0.00730	0.01825	-0.01289	0.01335	-0.00280	0.02621	0.04459	0.22985
ε_{22}	-0.00326	0.01321	0.02056	0.01184	-0.01081	0.02000	-0.03923	0.13576
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	-0.00404	0.01386	-0.00767	0.00628	0.01362	0.01153	-0.00536	0.02379
ε_{31}	-0.01247	0.01786	-0.00088	0.01436	0.03454	0.02491	-0.07394	0.08564
ε_{32}	0.01840	0.01299	-0.01605	0.01263	-0.02283	0.01868	0.01023	0.73355
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.00593	0.01352	0.01693*	0.00689	-0.01171	0.01119	0.06371*	0.02745
ε_{41}	-0.01064	0.01789	-0.00457	0.01297	0.00244	0.02590	-0.06624	0.12499
ε_{42}	0.03006	0.01339	0.01177	0.01161	0.00676	0.01973	0.05850	0.05050
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	-0.01942	0.01373	-0.00720	0.00608	-0.00920	0.01169	0.00774	0.02622

*Indicates statistically significant at .05 or less; Coeff.=Coefficients: S.E.=Standard Errors.

Table D-6: Almost Ideal Demand Systems Results for Total Fresh Cut Flowers in Region 3 (within income group).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.07513	0.05065	0.09290*	0.03885	-0.06031	0.06513	0.04137	0.06419
$\gamma_{12}=\gamma_{21}$	-0.00575	0.04709	-0.05363*	0.02662	0.04734	0.05253	0.01649	0.04941
$\gamma_{13}=\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.06938*	0.01838	-0.03927*	0.01783	0.01296	0.02285	-0.05786*	0.02524
γ_{22}	-0.01063	0.04955	0.07191*	0.02344	-0.00892	0.04818	0.00642	0.04471
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	0.01638	0.02317	-0.01828	0.01385	-0.03842*	0.01965	-0.02291	0.02168
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.05300*	0.01407	0.05756*	0.01150	0.02546*	0.01148	0.08076*	0.01618
Expenditure Effects								
β_1	0.09261*	0.03511	0.06509	0.03908	0.12536*	0.03520	0.11343*	0.03721
β_2	-0.11474*	0.02885	-0.04680	0.02731	-0.10109*	0.02990	-0.09387*	0.03021
$\beta_3=-\beta_1-\beta_2$	0.02213	0.02523	-0.01829	0.02646	-0.02427	0.02359	-0.01956	0.02654
Seasonality: Special Calender Occasions								
τ_{11}	-0.06098	0.06893	-0.10454*	0.05143	0.05479	0.05878	-0.04580	0.08791
τ_{12}	0.08010	0.05421	0.07260*	0.03574	-0.00812	0.05154	0.00636	0.07005
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.01912	0.04518	0.03194	0.03277	-0.04667	0.03415	0.03944	0.05547
Seasonality: Other Calander Occasions								
τ_{21}	-0.01780	0.04858	-0.04315	0.03534	0.01259	0.04671	0.01888	0.06497
τ_{22}	0.05503	0.03873	0.02283	0.02429	-0.00053	0.04033	-0.02756	0.05097
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.03723	0.03114	0.02033	0.02280	-0.01206	0.02678	0.00868	0.03935
Advertising Effects: PromoFlor								
λ_{11}	-0.01960	0.02054	-0.02337	0.01430	0.02074	0.01711	-0.02028	0.02557
λ_{12}	0.00733	0.01575	0.02987*	0.00998	-0.02779	0.01564	0.01677	0.02002
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	0.01227	0.01261	-0.00650	0.00909	0.00704	0.01079	0.00351	0.01500
Advertising Effects: Other Advertising								
λ_{21}	0.01102	0.01076	0.02238*	0.00801	-0.00256	0.00982	0.01244	0.01378
λ_{22}	-0.00788	0.00850	-0.01367*	0.00551	-0.00071	0.00854	-0.00050	0.01106
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.00314	0.00698	-0.00871	0.00513	0.00326	0.00572	-0.01194	0.00868
Behavioral Effects								
ε_{11}	0.03058	0.01871	0.00564	0.01286	-0.00620	0.01753	0.02223	0.02278
ε_{12}	-0.01693	0.01518	0.00226	0.00889	0.00847	0.01505	-0.01033	0.01813
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-0.01364	0.01225	-0.00790	0.00827	-0.00227	0.01076	-0.01190	0.01371
ε_{21}	0.00335	0.01891	0.00483	0.01295	-0.00076	0.01476	-0.01014	0.02442
ε_{22}	-0.01022	0.01527	-0.00078	0.00887	-0.00884	0.01282	0.00177	0.01928
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.00687	0.01250	-0.00404	0.00832	0.00959	0.00879	0.00837	0.01467
ε_{31}	0.00326	0.01951	0.03045*	0.01266	0.01620	0.01576	-0.00285	0.02552
ε_{32}	-0.00212	0.01565	-0.01151*	0.00879	-0.00956	0.01394	-0.03394	0.01998
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.00114	0.01219	-0.01894*	0.00814	-0.00664	0.00954	0.03679*	0.01495
ε_{41}	0.02645	0.01754	0.01316	0.01294	-0.02444	0.02066	0.00741	0.02313
ε_{42}	-0.01869	0.01403	-0.00720	0.00891	0.01246	0.01794	-0.00977	0.01853
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	-0.00776	0.01141	-0.00597	0.00829	0.01198	0.01155	0.00236	0.01439

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-7: Almost Ideal Demand Systems Results for Total Fresh Cut Flowers in Region 4 (within income group).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.02725	0.04271	0.13054*	0.03300	-0.03583	0.05154	0.08307*	0.02731
$\gamma_{12}=\gamma_{21}$	-0.02306	0.02765	-0.03193	0.02208	0.00002	0.01962	-0.03878*	0.02102
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.00419	0.02465	-0.09861*	0.01855	0.03580	0.04104	-0.04428*	0.01444
γ_{22}	0.05220*	0.02576	0.01974	0.02088	0.03374*	0.01369	0.04684*	0.02167
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.02913	0.01711	0.01219	0.0292	-0.03376*	0.01651	-0.00806	0.01229
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.03332*	0.01851	0.08642*	0.01439	-0.00204	0.03744	0.05234*	0.01481
Expenditure Effects								
β_1	0.06647	0.03807	0.03890	0.04366	0.11627*	0.02986	0.03408	0.03357
β_2	-0.04990*	0.02618	-0.02616	0.03009	-0.02134	0.01933	-0.05472*	0.01870
$\beta_3=-\beta_1-\beta_2$	-0.01657	0.03151	-0.01275	0.03117	-0.09494*	0.02537	0.02064	0.02299
Seasonality: Special Calender Occasions								
τ_{11}	0.09561	0.08608	-0.01191	0.08557	-0.03836	0.06526	-0.06976	0.08362
τ_{12}	-0.03035	0.05573	0.00374	0.05848	0.02429	0.03858	0.09079	0.04931
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.06525	0.06679	0.00817	0.05953	0.01407	0.05444	-0.02103	0.05711
Seasonality: Other Calander Occasions								
τ_{21}	-0.03058	0.06419	-0.04334	0.06238	0.00080	0.04791	-0.18672*	0.06331
τ_{22}	0.02382	0.04186	0.02277	0.04250	0.00299	0.02783	0.10484*	0.03728
$\tau_{23}=-\tau_{21}-\tau_{22}$	0.00676	0.04943	0.02057	0.04331	-0.00378	0.03992	0.08188*	0.04281
Advertising Effects: PromoFlor								
λ_{11}	0.02731	0.02512	0.04249	0.02259	-0.04759*	0.01845	0.01818	0.02427
λ_{12}	-0.01348	0.01674	-0.01959	0.01552	0.00841	0.01081	0.00820	0.01389
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.01382	0.02024	-0.02291	0.01579	0.03918*	0.01550	-0.02637	0.01642
Advertising Effects: Other Advertising								
λ_{21}	-0.02005	0.01412	-0.00245	0.01360	0.02102*	0.01034	0.01457	0.01390
λ_{22}	0.01328	0.00923	-0.00198	0.00932	-0.00365	0.00614	-0.00982	0.00819
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	0.00677	0.01109	0.00444	0.00947	-0.01737*	0.00863	-0.00476	0.00956
Behavioral Effects								
ε_{11}	0.01845	0.02291	0.02399	0.02077	-0.00091	0.01733	0.02861	0.02175
ε_{12}	0.01295	0.01486	-0.01749	0.01418	-0.00467	0.00973	0.00805	0.01270
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-0.03140	0.01799	-0.00650	0.01452	0.00558	0.01446	-0.03666*	0.01538
ε_{21}	-0.01500	0.02411	0.00381	0.02088	-0.01153	0.01612	0.01621	0.02450
ε_{22}	-0.01658	0.01587	0.01037	0.01451	-0.00424	0.00933	-0.01988	0.01427
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.03158	0.01889	-0.01417	0.01448	0.01577	0.01358	0.00367	0.01564
ε_{31}	0.01272	0.02316	0.00043	0.02163	-0.00873	0.01773	0.03318	0.02742
ε_{32}	0.00665	0.01534	0.00135	0.01485	-0.00353	0.01028	0.01434	0.01583
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.01937	0.01767	-0.00178	0.01499	0.01226	0.01486	-0.04752*	0.01568
ε_{41}	-0.02800	0.02357	0.01136	0.01969	-0.00727	0.01686	0.01299	0.02316
ε_{42}	0.00028	0.01541	0.00742	0.01352	0.01748	0.00955	-0.02066	0.01385
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	0.02771	0.01847	-0.01878	0.01387	-0.01021	0.01415	0.00767	0.01438

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-8: Almost Ideal Demand Systems Results for Arrangements (across income groups).

Parameters	Income Group : 1		Income Group : 2		Income Group : 3		Income Group : 4	
	Coeff.	S.E	Coeff.	S.E	Coeff.	S.E	Coeff.	S.E
Price Effects								
γ_{11}	0.00629	0.02241	0.06314*	0.02663	0.05687	0.03065	0.07403	0.05391
$\gamma_{12}=\gamma_{21}$	0.00620	0.01396	-0.05393*	0.01592	-0.00460	0.02480	-0.06045*	0.01274
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.01249	0.01678	-0.00920	0.03186	-0.05227*	0.01271	-0.01358	0.05844
γ_{22}	0.00347	0.01652	0.04527*	0.01663	0.02144	0.02323	0.03067*	0.00849
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.00967	0.01091	0.00866	0.01435	-0.01684*	0.00802	0.02978*	0.01242
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.02216	0.01594	0.00055	0.03713	0.06911*	0.00845	-0.01619	0.06353
Expenditure Effects								
β_1	0.02510	0.05253	0.04400	0.03936	-0.04675	0.03626	0.08446*	0.04464
β_2	-0.01735	0.02641	0.04809*	0.02073	0.03952	0.03470	0.03137*	0.01377
$\beta_3=-\beta_1-\beta_2$	-0.00775	0.04859	-0.09210*	0.03104	0.00723	0.01667	-0.11584*	0.03979
Seasonality: Special Calender Occasions								
τ_{11}	-0.07886	0.05942	-0.11360*	0.05008	0.10690*	0.04100	-0.04929	0.08041
τ_{12}	0.08367*	0.03351	0.01194	0.02434	-0.06960	0.03891	-0.04496	0.02489
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.00482	0.05563	0.10166*	0.04087	-0.03731	0.02289	0.09425	0.07534
Seasonality: Other Calender Occasions								
τ_{21}	-0.03701	0.05284	-0.08964*	0.03594	0.03915	0.03210	-0.01940	0.06891
τ_{22}	0.08175*	0.02966	0.04785*	0.01694	-0.03427	0.03033	-0.02528	0.02079
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.04474	0.04935	0.04179	0.03042	-0.00487	0.01851	0.04468	0.06594
Advertising Effects: PromoFlor								
λ_{11}	0.01646	0.01734	0.01858	0.01045	-0.01441	0.01020	0.00625	0.02018
λ_{12}	-0.00960	0.00937	-0.00671	0.00496	-0.01577	0.00964	0.00259	0.00599
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.00686	0.01694	-0.01187	0.00890	0.03018*	0.00570	-0.00884	0.02035
Advertising Effects: Other Advertising								
λ_{21}	0.01840	0.00979	0.01974*	0.00654	0.00275	0.00566	0.01040	0.01160
λ_{22}	-0.00200	0.00539	-0.01507*	0.00310	0.00533	0.00530	-0.00041	0.00344
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.01639	0.00917	-0.00467	0.00559	-0.00809*	0.00331	-0.01000	0.01572
Behavioral Effects								
ε_{11}	0.03149	0.01880	-0.06103*	0.01426	0.01929*	0.00976	-0.02781	0.02233
ε_{12}	0.01363	0.00948	0.04808*	0.00697	0.00477	0.00927	0.01827*	0.00620
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-	0.01729	0.01296	0.01162	-0.02406	0.00485	0.00954	0.02028
ε_{21}	-0.00496	0.01529	-0.01798	0.01332	-0.01938	0.01003	0.01990	0.01724
ε_{22}	0.00015	0.00752	0.02177*	0.00653	0.01751	0.00971	-0.00281	0.00495
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.00480	0.01394	-0.00379	0.01065	0.00187	0.00473	-0.01709	0.01697
ε_{31}	-0.00287	0.01746	0.07943*	0.01863	0.00524	0.00969	0.04036	0.02226
ε_{32}	-0.00303	0.00836	-0.06530*	0.00953	0.00820	0.00920	-0.00543	0.00637
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	0.00589	0.01598	-0.01413	0.01499	-0.01344*	0.00505	-0.03493	0.03231
ε_{41}	-0.01968	0.01780	0.00149	0.00988	0.00043	0.01131	0.00826	0.01846
ε_{42}	0.01555	0.00860	0.00686	0.00509	0.00556	0.01060	0.00173	0.00510
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	0.00413	0.01637	-0.00836	0.00770	-0.00599	0.00543	-0.01000	0.01245

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-9: Almost Ideal Demand Systems Results for Single Stems (across income groups).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.14985*	0.04877	0.07647*	0.03306	-0.13128	0.08289	-0.02067	0.06826
$\gamma_{12}=\gamma_{21}$	-0.12984*	0.05063	0.01969	0.02588	0.07682	0.06192	0.08241	0.05442
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.02002	0.02979	-0.09616*	0.01721	0.05446	0.05048	-0.06174	0.03363
γ_{22}	0.15073*	0.06052	0.02321	0.02633	-0.02156	0.05870	-0.06695	0.05546
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.02090	0.03866	-0.04290*	0.01528	-0.05526	0.02989	-0.01546	0.03429
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.04092	0.04002	0.13906*	0.01657	0.00080	0.03781	0.07720*	0.02610
Expenditure Effects								
β_1	0.04942	0.03907	0.06684*	0.02630	0.17054*	0.02610	0.12908*	0.03109
β_2	-0.10566*	0.02836	-0.05356*	0.02369	-0.10589*	0.02716	-0.15889*	0.02355
$\beta_3=-\beta_1-\beta_2$	0.05624	0.03181	-0.01328	0.01743	-0.06465*	0.02633	0.02981	0.02753
Seasonality: Special Calender Occasions								
τ_{11}	0.14568*	0.07450	0.01816	0.05535	0.07217	0.06958	0.00413	0.07668
τ_{12}	-0.11374	0.06065	0.02548	0.04846	0.00312	0.05895	0.01423	0.05903
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.03194	0.05254	-0.04364	0.03218	-0.07529	0.06047	-0.01836	0.05869
Seasonality: Other Calender Occasions								
τ_{21}	0.03049	0.05708	0.02656	0.04093	0.08450	0.05148	-0.03023	0.05766
τ_{22}	0.00588	0.04679	0.01006	0.03613	-0.02129	0.04371	-0.02006	0.04724
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.03637	0.03900	-0.03662	0.02368	-0.06320	0.04423	0.05029	0.04171
Advertising Effects: PromoFlor								
λ_{11}	-0.00733	0.02296	0.03949*	0.01660	-0.00745	0.02140	-0.00941	0.02261
λ_{12}	0.00264	0.01825	-0.02666	0.01463	0.00518	0.01884	0.04356*	0.01818
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	0.00468*	0.01651	-0.01283*	0.00973	0.00227	0.01875	-0.03415*	0.01788
Advertising Effects: Other Advertising								
λ_{21}	0.00740	0.01172	-0.00197	0.00965	0.01450	0.01209	0.02300	0.03709
λ_{22}	0.00729	0.00899	0.00476	0.00823	-0.00811	0.01041	-0.03122	0.04268
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.01469	0.00877	-0.00280	0.00556	-0.00639	0.01055	0.00823	0.01500
Behavioral Effects								
ε_{11}	0.00069	0.02733	0.02112	0.01972	-0.02116	0.01720	-0.04606*	0.02187
ε_{12}	-0.02000	0.02068	-0.02856	0.01696	0.03549*	0.01609	0.05221*	0.01767
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	0.01931	0.01990	0.00745	0.01309	-0.01433	0.01454	-0.00615	0.01815
ε_{21}	0.00778	0.01806	0.02860*	0.01379	0.01216	0.01485	0.02492	0.01792
ε_{22}	-0.00689	0.01387	-0.00994	0.01187	0.00523	0.01502	-0.00131	0.01500
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	-0.00089	0.01321	-0.01866*	0.00899	-0.01738	0.01284	-0.02361	0.01407
ε_{31}	-0.00608	0.02415	-0.02699	0.02021	0.00070	0.01668	0.00600	0.02278
ε_{32}	0.03942*	0.01788	0.04098*	0.01721	-0.02437	0.01688	-0.01835	0.01800
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.03334*	0.01790	-0.01399	0.01384	0.02367	0.01446	0.01235	0.01787
ε_{41}	0.00291	0.01816	-0.01748	0.01251	-0.00724	0.01445	-0.01182	0.01912
ε_{42}	0.01438	0.01359	0.01269	0.01075	-0.00215	0.01536	0.01632	0.01648
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	-0.01729	0.01323	0.00479	0.00857	0.00939	0.01303	-0.00450	0.01430

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-10: Almost Ideal Demand Systems Results for Bouquets/Boxes/Corsage (across income groups).

Parameters	Income Group : 1		Income Group : 2		Income Group : 3		Income Group : 4	
	Coeff.	S.E	Coeff.	S.E	Coeff.	S.E	Coeff.	S.E
Price Effects								
γ_{11}	0.16914*	0.03658	-1.02462*	0.26707	0.07252	0.06368	-0.48466*	0.16091
$\gamma_{12}=\gamma_{21}$	-0.04725	0.04913	0.85379*	0.20958	-0.02336	0.04051	0.30568*	0.12450
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.12188	0.03562	0.17083	0.09989	-0.04915	0.03552	0.17897	0.10428
γ_{22}	-0.00903	0.08126	-0.66342*	0.18701	0.02873	0.03436	-0.15495	0.12166
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	0.05629	0.05668	-0.19038*	0.07386	-0.00537	0.02283	-0.15073*	0.05246
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.06560	0.05626	0.01954	0.03272	0.05452*	0.02691	-0.02824	0.06751
Expenditure Effects								
β_1	0.02771	0.04306	0.32866*	0.03043	0.09955*	0.03635	0.27661*	0.03043
β_2	-0.12050*	0.04365	-0.27083*	0.02674	-0.06566*	0.02579	-0.17059*	0.03554
$\beta_3=-\beta_1-\beta_2$	0.09279*	0.03823	-0.05782*	0.02260	-0.03389	0.02674	-0.10602*	0.03603
Seasonality: Special Calender Occasions								
τ_{11}	0.08954	0.06093	-0.17993*	0.09725	-0.01000	0.07347	-0.02934	0.10381
τ_{12}	-0.02909	0.06349	0.10935	0.07240	-0.00227	0.05018	0.04217	0.06735
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.06045	0.05345	0.07059	0.04084	0.01227	0.04649	-0.01283	0.07021
Seasonality: Other Calender Occasions								
τ_{21}	0.04973	0.04853	-0.13168	0.07895	-0.09130	0.05506	-0.16388*	0.08134
τ_{22}	-0.05076	0.05109	0.09359	0.05940	0.04142	0.03729	0.09209	0.05615
$\tau_{23}=-\tau_{21}-\tau_{22}$	0.00103	0.04087	0.03809	0.03098	0.04988	0.03452	0.07179	0.05414
Advertising Effects: PromoFlor								
λ_{11}	0.01420	0.01791	0.00729	0.02429	-0.00811	0.02144	-0.01070	0.02802
λ_{12}	0.01065	0.01870	0.00742	0.01870	0.01399	0.01479	0.02626	0.02068
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.02485	0.01457	-0.01471	0.01054	-0.00587	0.01377	-0.01556	0.01854
Advertising Effects: Other Advertising								
λ_{21}	-0.01644	0.00891	0.05809*	0.01754	0.00806	0.01188	0.01594	0.03663
λ_{22}	0.00962	0.00902	-0.04420*	0.01316	0.00081	0.00824	0.00205	0.02230
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	0.00681	0.00895	-0.01389	0.00735	-0.00888	0.00752	-0.01799	0.01699
Behavioral Effects								
ε_{11}	-0.00857	0.02340	-0.03461	0.03434	-0.03198	0.01798	0.04856	0.02583
ε_{12}	-0.00361	0.02435	0.03040	0.02562	0.03425*	0.01246	0.00821	0.01987
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	0.01219	0.01945	0.00420	0.01549	-0.00227	0.01186	-0.05678*	0.01695
ε_{21}	0.01495	0.01506	0.03450	0.02754	-0.01727	0.01585	-0.05207*	0.02061
ε_{22}	-0.02295	0.01591	-0.02500	0.02134	0.00618	0.01081	0.02661	0.01646
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.00800	0.01261	-0.00950	0.01173	0.01109	0.01071	0.02546	0.01402
ε_{31}	0.00778	0.02116	0.06450	0.04047	-0.02559	0.01866	-0.11645*	0.02538
ε_{32}	0.00468	0.02180	-0.05758	0.02998	-0.00598	0.01288	0.07525*	0.02033
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.01246	0.01783	-0.00692	0.01778	0.03157*	0.01264	0.04120*	0.01781
ε_{41}	-0.03258*	0.01502	-0.00072	0.02541	-0.00573	0.01661	-0.01146	0.02243
ε_{42}	0.01878	0.01620	0.02076	0.01864	0.00047	0.01140	0.01115	0.01737
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	0.01380	0.01285	-0.02005	0.01083	0.00526	0.01125	0.00030	0.01583

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-11: Almost Ideal Demand Systems Results for Cut Flowers in Region 1 (across income groups).

Parameters	Income Group : 1		Income Group : 2		Income Group : 3		Income Group : 4	
	Coeff.	S.E	Coeff.	S.E	Coeff.	S.E	Coeff.	S.E
Price Effects								
γ_{11}	0.15950*	0.03188	0.04991*	0.01637	-0.06263	0.09710	-0.07555	0.09933
$\gamma_{12}=\gamma_{21}$	-0.03149	0.02973	-0.02146	0.01258	0.06397	0.06508	0.01389	0.03635
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.12801*	0.02133	-0.02845	0.00953	-0.00134	0.04234	0.06167	0.07236
γ_{22}	-0.00743	0.03467	0.03700*	0.01403	-0.04130	0.05032	0.04287*	0.01932
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	0.03891	0.02918	-0.01553*	0.00779	-0.02266	0.02937	-0.05676*	0.02446
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.08910*	0.03162	0.04399*	0.00825	0.02400	0.01897	-0.00491	0.05625
Expenditure Effects								
β_1	0.04839	0.03703	0.02345	0.02242	0.13417*	0.03865	0.15963*	0.03868
β_2	-0.08431*	0.02552	-0.02164	0.01535	-0.10742*	0.02407	-0.05136*	0.02109
$\beta_3=-\beta_1-\beta_2$	0.03592	0.03702	-0.00181	0.01506	-0.02675	0.02813	-0.10827*	0.03240
Seasonality: Special Calender Occasions								
τ_{11}	0.12691	0.07955	0.03483	0.05004	0.00021	0.08312	0.01494	0.09514
τ_{12}	-0.07395	0.05874	-0.00331	0.03335	0.03766	0.05371	-0.02903	0.04478
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.05295	0.07233	-0.03153	0.03236	-0.03786	0.05169	0.01409	0.07580
Seasonality: Other Calender Occasions								
τ_{21}	0.05578	0.05959	-0.01887	0.03763	-0.06413	0.06224	-0.06928	0.07220
τ_{22}	-0.04714	0.04440	0.05287*	0.02538	0.04479	0.04115	0.01807	0.03397
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.00864	0.05378	-0.03401	0.02416	0.01934	0.03793	0.05121	0.05739
Advertising Effects: PromoFlor								
λ_{11}	-0.01308	0.02135	0.04134 *	0.01473	0.01080	0.02369	-0.02707	0.02601
λ_{12}	0.01883	0.01656	-0.02518*	0.00983	-0.01385	0.01520	0.01175	0.01232
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.00575	0.01781	-0.01616*	0.00961	0.00305	0.01395	0.01532	0.02054
Advertising Effects: Other Advertising								
λ_{21}	-0.00206	0.01308	-0.00885	0.00760	0.00834	0.01296	0.01573	0.01935
λ_{22}	0.00751	0.00958	-0.00457	0.00510	-0.00947	0.00832	0.00470	0.00930
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.00545	0.01190	0.01342*	0.00491	0.00113	0.00809	-0.02042	0.01310
Behavioral Effects								
ε_{11}	0.03197	0.01883	0.03720*	0.01363	-0.01675	0.01956	0.00904	0.02224
ε_{12}	-0.01032	0.01351	-0.02408*	0.00918	0.03375*	0.01258	-0.00069	0.01009
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-0.02165	0.01745	-0.01312	0.00918	-0.01700	0.01236	-0.00835	0.01748
ε_{21}	0.05464*	0.01892	-0.03070*	0.01329	-0.04889*	0.02129	-0.03379	0.02350
ε_{22}	-0.00534	0.01372	0.01392	0.00893	0.02650*	0.01342	-0.00343	0.01109
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	-0.04930*	0.01726	0.01678*	0.00886	0.02239	0.01302	0.03722*	0.01819
ε_{31}	0.00514	0.01866	0.02844*	0.01134	-0.02123	0.02125	-0.03968	0.02443
ε_{32}	0.03208*	0.01398	-0.02357*	0.00758	0.00346	0.01358	0.00514	0.01172
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.03723*	0.01741	-0.00487	0.00755	0.01777	0.01305	0.03455	0.01931
ε_{41}	0.00439	0.02098	0.01203	0.01244	-0.00280	0.01710	-0.05240*	0.02569
ε_{42}	-0.00228	0.01452	-0.00926	0.00855	-0.01566	0.01110	0.01521	0.01161
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	-0.00211	0.01882	-0.00277	0.00827	0.01845	0.01092	0.03719	0.02035

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-12: Almost Ideal Demand Systems Results for Cut Flowers in Region 2 (across income groups).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E.**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.09413	0.07800	0.04172	0.04072	0.00395	0.05194	-0.00965	0.06645
$\gamma_{12}=\gamma_{21}$	-0.06073	0.03478	0.00785	0.03465	0.00711	0.04126	0.05319	0.04622
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.03340	0.06445	-0.04957*	0.01374	-0.01106	0.01786	-0.04354	0.02777
γ_{22}	0.03721	0.02682	0.00267	0.03212	0.02532	0.03625	-0.02707	0.03714
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	0.02352	0.04033	-0.01052	0.01084	-0.03243*	0.01388	-0.02612	0.02036
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.00988	0.07013	0.06009*	0.00894	0.04349*	0.00942	0.06966*	0.01517
Expenditure Effects								
β_1	0.09433*	0.04919	0.07119*	0.03696	0.07273*	0.03861	0.10706*	0.04142
β_2	-0.01116	0.04312	-0.05689	0.03498	-0.06262*	0.03014	-0.08999*	0.02629
$\beta_3=-\beta_1-\beta_2$	-0.08317*	0.04386	-0.01430	0.01844	-0.01011	0.01878	-0.01707	0.02660
Seasonality: Special Calender Occasions								
τ_{11}	0.05708	0.09552	-0.02116	0.05482	0.19185	0.11036	0.10595	0.13443
τ_{12}	0.03670	0.06709	0.07080	0.05145	-0.16318*	0.08573	0.09584	0.08763
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.09378	0.07398	-0.04964	0.02670	-0.02867	0.04747	-0.20179*	0.07448
Seasonality: Other Calender Occasions								
τ_{21}	0.10694	0.07929	-0.00475	0.04201	0.03940	0.10063	0.04874	0.10394
τ_{22}	0.03592	0.05539	0.03588	0.03938	-0.02812	0.07871	0.08196	0.06780
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.14286*	0.06121	-0.03113	0.02052	-0.01128	0.04281	-0.13070*	0.05709
Advertising Effects: PromoFlor								
λ_{11}	-0.00576	0.01998	0.00594	0.01239	-0.02192	0.02694	0.02865	0.03548
λ_{12}	0.01448	0.01459	0.00684	0.01139	0.01811	0.02096	0.01720	0.02388
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.00871	0.01573	-0.01278*	0.00611	0.00381	0.01153	-0.04584*	0.01940
Advertising Effects: Other Advertising								
λ_{21}	-0.01102	0.01645	0.01168	0.00852	0.00593	0.01866	-0.00959	0.03475
λ_{22}	-0.00604	0.01165	-0.01391	0.00798	0.00364	0.01458	-0.02047	0.02602
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	0.01707	0.01296	0.00223	0.00421	-0.00957	0.00819	0.03006*	0.01331
Behavioral Effects								
ε_{11}	-0.00037	0.02929	-0.01144	0.01338	0.05140	0.03001	0.05309	0.03556
ε_{12}	-0.02909	0.02071	0.00428	0.01260	-0.02330	0.02356	-0.01966	0.02328
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	0.02946	0.02285	0.00716	0.00661	-0.02810*	0.01290	-0.03343	0.02019
ε_{21}	-0.00343	0.02556	-0.01938	0.01569	-0.01688	0.02468	0.04447	0.04273
ε_{22}	0.00350	0.01864	0.02861	0.01432	0.00929	0.01971	-0.01940	0.02794
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	-0.00008	0.02042	-0.00923	0.00727	0.00759	0.01030	-0.02507	0.02445
ε_{31}	-0.03810	0.02378	-0.00405	0.01757	0.03337	0.03720	-0.12082*	0.04739
ε_{32}	0.02737	0.01776	-0.01585	0.01599	-0.04717	0.02917	0.03639	0.03127
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	0.01073	0.01906	0.01991*	0.00875	0.01380	0.01608	0.08443*	0.02636
ε_{41}	-0.01115	0.02321	-0.00115	0.01557	0.02766	0.04000	-0.04040	0.04641
ε_{42}	0.02321	0.01735	0.01231	0.01457	-0.01658	0.03130	0.04469	0.03043
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	-0.01206	0.01898	-0.01116*	0.00728	-0.01108	0.01757	-0.00430	0.02438

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-13: Almost Ideal Demand Systems Results for Cut Flowers in Region 3 (across income groups).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.05336	0.06694	0.07752	0.05784	-0.04614	0.05821	0.00271	0.07605
$\gamma_{12}=\gamma_{21}$	-0.01997	0.04663	-0.03794	0.03995	0.03225	0.04766	0.05400	0.05688
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	-0.03339	0.03015	-0.03958	0.02344	0.01389	0.02086	-0.05671	0.02926
γ_{22}	0.02723	0.03779	0.05668	0.03173	0.00389	0.04526	-0.02193	0.04996
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.00726	0.01999	-0.01874	0.01629	-0.03614	0.01935	-0.03207	0.02521
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.04066*	0.01493	0.05833*	0.01203	0.02225*	0.01136	0.08878*	0.01486
Expenditure Effects								
β_1	0.11563*	0.03451	0.08749*	0.04034	0.11255*	0.03670	0.14269*	0.03663
β_2	-0.09177*	0.02812	-0.06254*	0.02926	-0.09220*	0.03138	-0.11786*	0.02707
$\beta_3=-\beta_1-\beta_2$	-0.02386	0.02427	-0.02495	0.02437	-0.02035	0.02559	-0.02483	0.02639
Seasonality: Special Calender Occasions								
τ_{11}	-0.04045	0.07037	-0.13117*	0.05609	0.04897	0.05840	-0.11158	0.08971
τ_{12}	0.03231	0.05232	0.08137*	0.03964	-0.00862	0.05181	0.07013	0.06721
$\tau_{13}=-\tau_{11}-\tau_{12}$	0.00814	0.04895	0.04980	0.03207	-0.04035	0.03611	0.04145	0.05787
Seasonality: Other Calender Occasions								
τ_{21}	0.02106	0.05099	-0.07046	0.03803	0.00306	0.04656	-0.00401	0.06785
τ_{22}	0.02437	0.03905	0.03312	0.02631	-0.00187	0.04081	-0.01432	0.05140
$\tau_{23}=-\tau_{21}-\tau_{22}$	-0.04543	0.03442	0.03734	0.02207	-0.00119	0.02819	0.01834	0.04080
Advertising Effects: PromoFlor								
λ_{11}	-0.01640	0.02222	-0.01197	0.01521	0.02321	0.01658	-0.02748	0.02757
λ_{12}	0.00784	0.01608	0.02445*	0.01064	-0.02793	0.01528	0.02570	0.02115
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	0.00856	0.01460	-0.01248*	0.00874	0.00472	0.01103	0.00179	0.01577
Advertising Effects: Other Advertising								
λ_{21}	-0.00460	0.01076	0.02755*	0.00859	-0.00228	0.00968	0.04826	0.02786
λ_{22}	0.00625	0.00769	-0.01756*	0.00598	-0.00131	0.00850	-0.03168	0.02293
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	-0.00165	0.00777	-0.00999*	0.00491	0.00359	0.00600	-0.01658	0.01102
Behavioral Effects								
ε_{11}	0.05550*	0.02000	0.01715	0.01337	0.00790	0.01608	0.01936	0.02482
ε_{12}	-0.02488	0.01473	0.00017	0.00952	0.00244	0.01406	-0.01781	0.01901
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-0.03062*	0.01311	-0.01732*	0.00748	-0.01035	0.01047	-0.00155	0.01312
ε_{21}	0.02298	0.01858	0.00064	0.01260	0.00328	0.01433	-0.00486	0.02606
ε_{22}	-0.02592*	0.01356	-0.00240	0.00897	-0.00845	0.01274	0.00614	0.01973
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.00294	0.01248	0.00176	0.00710	0.00517	0.00911	-0.00127	0.01401
ε_{31}	0.02414	0.01989	0.04353*	0.01246	0.01955	0.01496	0.00827	0.02741
ε_{32}	-0.00878	0.01441	-0.01763*	0.00892	-0.01412	0.01337	-0.04568	0.02058
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.01536	0.01264	-0.02591*	0.00699	-0.00542	0.00953	0.03742*	0.01449
ε_{41}	0.02283	0.01886	0.02410	0.01312	-0.02087	0.02057	0.00292	0.02406
ε_{42}	-0.00901	0.01330	-0.01495	0.00934	0.00906	0.01807	-0.00272	0.01860
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	-0.01382	0.01257	-0.00915	0.00738	0.01181	0.01224	-0.00020	0.01370

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-14: Almost Ideal Demand Systems Results for Cut Flowers in Region 4 (across income groups).

Parameters	**Income Group : 1**		**Income Group : 2**		**Income Group : 3**		**Income Group : 4**	
	Coeff.	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**	**Coeff.**	**S.E**
Price Effects								
γ_{11}	0.03954	0.02651	0.14872*	0.02598	-0.02864	0.04018	0.08142*	0.01896
$\gamma_{12}=\gamma_{21}$	-0.04179	0.02290	-0.03893*	0.01847	0.00966	0.01785	-0.03128	0.01706
$\gamma_{13}=-\gamma_{11}-\gamma_{12}=\gamma_{31}$	0.00225	0.01539	-0.10979*	0.01397	0.01898	0.03012	-0.05014*	0.01406
γ_{22}	0.06303*	0.02556	0.02327	0.01806	0.02356	0.01335	0.03746*	0.01933
$\gamma_{23}=-\gamma_{22}-\gamma_{21}=\gamma_{32}$	-0.02124	0.01663	0.01566	0.01069	-0.03322*	0.01405	-0.00618	0.01337
$\gamma_{33}=-\gamma_{31}-\gamma_{32}$	0.01899	0.01709	0.09413*	0.01112	0.01423	0.02707	0.05633*	0.01697
Expenditure Effects								
β_1	0.03778	0.03413	0.02659	0.04078	0.10420*	0.02660	0.03519	0.03094
β_2	-	0.02457	-0.02398	0.02757	-0.02455	0.01865	-0.06827*	0.01750
$\beta_3=-\beta_1-\beta_2$	0.02143	0.02839	-0.00261	0.02755	-0.07964*	0.02205	0.03309	0.02252
Seasonality: Special Calender Occasions								
τ_{11}	0.09837	0.08148	-0.01564	0.08357	-0.03317	0.06259	-0.08749	0.08269
τ_{12}	-0.04096	0.05492	0.01562	0.05763	0.01917	0.03861	0.11116*	0.04846
$\tau_{13}=-\tau_{11}-\tau_{12}$	-0.05741	0.06532	0.00002	0.05693	0.01401	0.05268	-0.02367	0.05617
Seasonality: Other Calender Occasions								
τ_{21}	-0.04139	0.06105	-0.05554	0.06091	0.01421	0.04620	-0.18778*	0.06209
τ_{22}	0.01570	0.04156	0.03844	0.04193	-0.00249	0.02795	0.11116*	0.03647
$\tau_{23}=-\tau_{21}-\tau_{22}$	0.02569	0.04850	0.01710	0.04148	-0.01171	0.03889	0.07662	0.04160
Advertising Effects: PromoFlor								
λ_{11}	0.02522	0.02406	0.04810*	0.02213	-0.04668*	0.01772	0.01700	0.02288
λ_{12}	-0.01249	0.01656	-0.02601	0.01529	0.00820	0.01086	0.01128	0.01300
$\lambda_{13}=-\lambda_{11}-\lambda_{12}$	-0.01273	0.01996	-0.02209	0.01523	0.03849*	0.01502	-0.02828	0.01620
Advertising Effects: Other Advertising								
λ_{21}	-0.02082	0.01339	-0.00104	0.01330	0.02015*	0.01003	0.02208	0.01575
λ_{22}	0.01535	0.00897	-0.00269	0.00920	-0.00258	0.00617	-0.02255*	0.01184
$\lambda_{23}=-\lambda_{21}-\lambda_{22}$	0.00547	0.01096	0.00373	0.00911	-0.01758	0.00849	0.00047	0.01017
Behavioral Effects								
ε_{11}	0.00354	0.01939	0.02544	0.01876	0.01417	0.01463	0.03079	0.01929
ε_{12}	0.00918	0.01372	-0.01194	0.01262	-0.00047	0.00933	0.01188	0.01132
$\varepsilon_{13}=-\varepsilon_{11}-\varepsilon_{12}$	-0.01272	0.01477	-0.01350	0.01255	-0.01370	0.01165	-0.04268*	0.01328
ε_{21}	-0.02299	0.02029	0.02620	0.01871	-0.00963	0.01361	0.02683	0.01941
ε_{22}	-0.01792	0.01468	-0.00873	0.01279	-0.00775	0.00901	-0.03302*	0.01148
$\varepsilon_{23}=-\varepsilon_{21}-\varepsilon_{22}$	0.04092*	0.01546	-0.01747	0.01243	0.01738	0.01093	0.00619	0.01353
ε_{31}	-0.00603	0.01934	-0.00189	0.01962	0.00137	0.01498	0.03592	0.02003
ε_{32}	0.01088	0.01417	0.00574	0.01333	-0.00147	0.00993	0.00580	0.01203
$\varepsilon_{33}=-\varepsilon_{31}-\varepsilon_{32}$	-0.00485	0.01427	-0.00385	0.01285	0.00009	0.01196	-0.04172*	0.01391
ε_{41}	-0.02623	0.02019	0.01502	0.01792	0.00011	0.01414	0.02263	0.01844
ε_{42}	-0.00212	0.01443	0.00243	0.01207	0.01606	0.00918	-0.02324*	0.01101
$\varepsilon_{43}=-\varepsilon_{41}-\varepsilon_{42}$	0.02834	0.01553	-0.01746	0.01199	-0.01617	0.01132	0.00060	0.01241

*Indicates statistically significant at .05 or less; Coeff.=Coefficients; S.E.=Standard Errors.

Table D-21: Number of observation used by the model, likelihood function value and number of iteration for within income group estimates.

Model	Number of Observation	Likelihood Function	Number of iteration before convergence
Fresh-cut flower: Income group 1	56	178.97	5
Fresh-cut flower: Income group 2	56	247.05	4
Fresh-cut flower: Income group 3	56	205.34	6
Fresh-cut flower: Income group 4	56	179.80	4
Arrangements: Income group 1	46	134.79	7
Arrangements: Income group 2	55	215.53	4
Arrangements: Income group 3	47	189.19	6
Arrangements: Income group 4	46	142.75	9
Single Stems: Income group 1	56	103.49	5
Single Stems: Income group 2	56	140.45	4
Single Stems: Income group 3	55	105.49	6
Single Stems: Income group 4	56	100.83	5
Corsage/Boxes/Bouquets: Income group 1	56	95.20	5
Corsage/Boxes/Bouquets: Income group 2	56	139.07	4
Corsage/Boxes/Bouquets: Income group 3	56	128.54	6
Corsage/Boxes/Bouquets: Income group 4	56	98.47	5
U.S. Region 1: Income group 1	55	93.19	5
U.S. Region 1: Income group 2	56	166.43	6
U.S. Region 1: Income group 3	55	130.53	5
U.S. Region 1: Income group 4	56	105.31	4
U.S. Region 2: Income group 1	55	116.15	7
U.S. Region 2: Income group 2	56	175.10	6
U.S. Region 2: Income group 3	53	117.91	7
U.S. Region 2: Income group 4	39	63.87	9
U.S. Region 3: Income group 1	55	119.65	5
U.S. Region 3: Income group 2	56	166.68	6
U.S. Region 3: Income group 3	55	137.95	6
U.S. Region 3: Income group 4	54	99.65	7
U.S. Region 4: Income group 1	56	87.48	6
U.S. Region 4: Income group 2	56	106.79	8
U.S. Region 4: Income group 3	56	132.23	6
U.S. Region 4: Income group 4	56	107.63	6

Table D-22: Number of observation used by the model, likelihood function values and number of iteration for across income group estimates.

Model	Number of Observations	Likelihood Function	Number of iterations before convergence
Fresh-cut flower	56	826.03	15
Arrangements	32	229.32**	9
Single Stems	55	465.79	24
Corsage/Boxes/Bouquets	56	482.20	22
U.S. Region 1	54	507.67	14
U.S. Region 2	36	268.21**	16
U.S. Region 3	52	511.74	15
U.S. Region 4	56	459.70	14

**LSQ did not converge. Models were estimated using regular SUR. Reported value is the trace of a matrix.

Table D-23: Test of model stability using negativity tests for within income group estimates.

Test of negativity	**Income Group : 1 (Under \$25,000)**	**Income Group : 2 (\$25,000-\$49,999)**	**Income Group : 3 (\$50,000-\$74,999)**	**Income Group : 4 (Over \$75,000)**
Cut Flowers:				
First Principal minor	-0.15275	-0.11236	-0.13892	-0.10492
Second Principal minor	0.00321	0.00540	0.00638	0.00568
Entire matrix	0.00000	0.00000	-0.00000	-0.00000
Arrangements:				
First Principal minor	-0.10943	-0.08434	-0.09505	-0.06773
Second Principal minor	0.00287	0.00176	0.00018	0.00144
Entire matrix	0.00000	0.00000	0.00000	0.00000
Single Stems:				
First Principal minor	-0.06598	-0.06130	-0.08318	-0.14620
Second Principal minor	0.00040	0.00127	0.00130	0.00848
Entire matrix	0.00000	-0.00000	0.00000	0.00000
Corsage/Box/Bouquet:				
First Principal minor	-0.08063	-0.12094	-0.13805	-0.00729
Second Principal minor	0.00355	0.00752	0.01234	0.00066
Entire matrix	-0.00000	-0.00000	0.00000	-0.00000
Cut Flower-U.S. Region 1:				
First Principal minor	-0.07089	-0.14670	-0.11617	-0.11962
Second Principal minor	0.00417	0.00547	0.00772	0.00584
Entire matrix	-0.00000	-0.00000	-0.00000	0.00000
Cut Flower-U.S. Region 2:				
First Principal minor	-0.09894	-0.13552	-0.14486	-0.15004
Second Principal minor	0.00737	0.00487	0.00318	0.00719
Entire matrix	-0.00000	-0.00000	0.00000	-0.00000
Cut Flower-U.S. Region 3:				
First Principal minor	-0.07632	-0.08558	-0.13652	-0.09757
Second Principal minor	0.00294	0.00262	0.00432	0.00536
Entire matrix	-0.00000	-0.00000	-0.00000	0.00000
Cut Flower-U.S. Region 4:				
First Principal minor	-0.18069	-0.10485	-0.14199	-0.15679
Second Principal minor	0.01075	0.00762	0.00534	0.01145
Entire matrix	0.00000	0.00000	-0.00000	0.00000

Table D-24: Test of model stability using negativity tests for across income group estimates.

Test of negativity	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Cut Flowers:				
First Principal minor	-0.14197	-0.11149	-0.13398	-0.11136
Second Principal minor	0.00381	0.00566	0.00663	0.00679
Entire matrix	0.00000	0.00000	-0.00000	-0.00000
Arrangements:				
First Principal minor	-0.13827	-0.07164	-0.04990	-0.03714
Second Principal minor	0.00467	0.00041	-0.00002	0.00039
Entire matrix	-0.00000	0.00000	0.00000	0.00000
Single Stems:				
First Principal minor	-0.07914	-0.13161	-0.11152	-0.13050
Second Principal minor	-0.00307	0.00024	0.00836	0.00582
Entire matrix	-0.00000	-0.00000	0.00000	0.00000
Corsage/Box/Bouquet:				
First Principal minor	-0.06710	-0.10821	-0.10001	0.01431
Second Principal minor	0.00232	0.00762	0.00897	-0.00170
Entire matrix	-0.00000	-0.00000	0.00000	0.00000
Cut Flower-U.S. Region 1:				
First Principal minor	-0.06104	-0.14623	-0.13098	-0.11507
Second Principal minor	0.00390	0.00543	0.00796	0.00597
Entire matrix	-0.00000	-0.00000	-0.00000	0.00000
Cut Flower-U.S. Region 2:				
First Principal minor	-0.07623	-0.14759	-0.16611	-0.14408
Second Principal minor	0.00514	0.00611	0.00471	0.00521
Entire matrix	-0.00000	0.00000	0.00000	-0.00000
Cut Flower-U.S. Region 3:				
First Principal minor	-0.05642	-0.07022	-0.15149	-0.07256
Second Principal minor	0.00284	0.00219	0.00512	0.00352
Entire matrix	-0.00000	-0.00000	-0.00000	0.00000
Cut Flower-U.S. Region 4:				
First Principal minor	-0.18994	-0.09224	-0.15613	-0.15795
Second Principal minor	0.00978	0.00621	0.00635	0.01081
Entire matrix	0.00000	0.00000	-0.00000	0.00000

APPENDIX E
DEMAND AND MARKET SHARE ELASTICITIES FOR OUTLETS FOR THREE TYPES OF FRESH-CUT FLOWERS AND FOUR U.S. REGIONS

Table E-1: Uncompensated price elasticities of demand for outlets for cut flowers in four U.S. regions

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
US. Region 1				
Florists (own price) ε_{11}	-0.76172	-0.94164	-0.97201	-0.94657
Supermarkets/Florists (cross price) ε_{21}	-0.12912	-0.08377	0.00772	-0.06045
Others/Florists/ (cross price) ε_{31}	-0.57302	-0.25307	-0.12464	-0.09703
Supermarkets (own) ε_{22}	-0.60690	-0.79482	-0.61320	-0.59754
Florists/Supermarkets (cross price) ε_{12}	-0.11949	-0.02853	-0.11989	-0.10652
Others/Supermarkets (cross price) ε_{32}	-0.00411	-0.10999	0.09912	-0.01604
Others (own) ε_{33}	-0.55298	-0.57155	-0.77082	-0.48624
Florists/Others (cross price) ε_{13}	-0.19104	-0.05009	-0.09347	-0.17694
Supermarkets/Others (cross price) ε_{23}	0.11748	-0.07657	0.15488	-0.05876
U.S. Region 2				
Florists (own price) ε_{11}	-0.86409	-0.96135	-1.01257	-0.97027
Supermarkets/Florists (cross price) ε_{21}	-0.22246	0.07251	0.06530	0.05486
Others/Florists/ (cross price) ε_{31}	-0.23084	-0.40530	-0.02961	-0.24186
Supermarkets (own) ε_{22}	-0.71830	-0.73069	-0.44555	-0.79512
Florists/Supermarkets (cross price) ε_{12}	-0.15767	-0.09896	-0.10098	-0.05804
Others/Supermarkets (cross price) ε_{32}	0.22739	-0.02245	-0.29090	-0.01955
Others (own) ε_{33}	-0.69214	-0.44826	-0.56526	-0.54161
Florists/Others (cross price) ε_{13}	-0.11179	-0.10200	-0.03366	-0.09500
Supermarkets/Others (cross price) ε_{23}	0.11401	0.03087	-0.11462	0.02424
U.S. Region 3				
Florists (own price) ε_{11}	-0.87620	-0.88593	-1.03179	-0.88053
Supermarkets/Florists (cross price) ε_{21}	-0.07156	-0.23011	0.09407	-0.04394
Others/Florists/ (cross price) ε_{31}	-0.56476	-0.30476	0.06046	-0.32281
Supermarkets (own) ε_{22}	-0.45183	-0.48947	-0.50310	-0.53237
Florists/Supermarkets (cross price) ε_{12}	-0.16181	-0.12764	-0.10599	-0.14889
Others/Supermarkets (cross price) ε_{32}	-0.06760	-0.07291	-0.15231	-0.02348
Others (own) ε_{33}	-0.55263	-0.46492	-0.65205	-0.55373
Florists/Others (cross price) ε_{13}	-0.10056	-0.08025	-0.03582	-0.15877
Supermarkets/Others (cross price) ε_{23}	0.06454	-0.03415	-0.03884	0.04166
U.S. Region 4				
Florists (own price) ε_{11}	-0.96860	-0.79019	-1.02314	-0.87663
Supermarkets/Florists (cross price) ε_{21}	-0.08475	-0.10287	-0.02498	-0.06990
Others/Florists/ (cross price) ε_{31}	-0.01079	-0.46652	0.13134	-0.22654
Supermarkets (own) ε_{22}	-0.60247	-0.86978	-0.71873	-0.65385
Florists/Supermarkets (cross price) ε_{12}	-0.09730	-0.08409	-0.04834	-0.10024
Others/Supermarkets (cross price) ε_{32}	-0.10269	0.08523	-0.03874	-0.07692
Others (own) ε_{33}	-0.80237	-0.55590	-0.46588	-0.78425
Florists/Others (cross price) ε_{13}	-0.04410	-0.19457	-0.09315	-0.08483
Supermarkets/Others (cross price) ε_{23}	-0.06175	0.08538	-0.10627	-0.01844

Table E-2: Compensated price elasticities of demand for outlets for fresh-cut flowers in four U.S. regions.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
U.S. Region 1				
Florists (own price) ε_{11}*	-0.11349	-0.20225	-0.17561	-0.20383
Supermarkets/Florists (cross price) ε_{21}*	0.24482	0.60844	0.31046	0.37236
Others/Florists/ (cross price) ε_{31}*	0.11019	0.42425	0.41039	0.26486
Supermarkets (own) ε_{22}*	-0.49188	-0.64039	-0.53798	-0.47650
Florists/Supermarkets (cross price) ε_{12}*	0.07990	0.13642	0.07798	0.10120
Others/Supermarkets (cross price) ε_{32}*	0.20604	0.04112	0.23205	0.08517
Others (own) ε_{33}*	-0.31623	-0.46536	-0.64244	-0.35003
Florists/Others (cross price) ε_{13}*	0.03359	0.06583	0.09763	0.10262
Supermarkets/Others (cross price) ε_{23}*	0.24706	0.03195	0.22752	0.10414
U.S. Region 2				
Florists (own price) ε_{11}*	-0.15675	-0.20887	-0.19552	-0.21781
Supermarkets/Florists (cross price) ε_{21}*	0.29343	0.47863	0.41775	0.53449
Others/Florists/ (cross price) ε_{31}*	0.20321	0.16183	0.60124	0.29604
Supermarkets (own) ε_{22}*	-0.52213	-0.57592	-0.35444	-0.65048
Florists/Supermarkets (cross price) ε_{12}*	0.11130	0.18780	0.11023	0.16886
Others/Supermarkets (cross price) ε_{32}*	0.39244	0.19368	-0.12782	0.14266
Others (own) ε_{33}*	-0.59564	-0.35551	-0.47342	-0.43871
Florists/Others (cross price) ε_{13}*	0.04546	0.02107	0.08529	0.04895
Supermarkets/Others (cross price) ε_{23}*	0.22870	0.09729	-0.06331	0.11599
U.S. Region 3				
Florists (own price) ε_{11}*	-0.11526	-0.12706	-0.18430	-0.16442
Supermarkets/Florists (cross price) ε_{21}*	0.23510	0.29281	0.41749	0.27829
Others/Florists/ (cross price) ε_{31}*	0.22720	0.27981	0.59766	0.21962
Supermarkets (own) ε_{22}*	-0.35454	-0.34622	-0.42110	-0.42452
Florists/Supermarkets (cross price) ε_{12}*	0.07960	0.08024	0.10888	0.09079
Others/Supermarkets (cross price) ε_{32}*	0.18366	0.08722	-0.01611	0.15807
Others (own) ε_{33}*	-0.41087	-0.36703	-0.58154	-0.37769
Florists/Others (cross price) ε_{13}*	0.03565	0.04683	0.07542	0.07363
Supermarkets/Others (cross price) ε_{23}*	0.11944	0.05342	0.00361	0.14624
U.S. Region 4				
Florists (own price) ε_{11}*	-0.29786	-0.18626	-0.20058	-0.29014
Supermarkets/Florists (cross price) ε_{21}*	0.36783	0.39846	0.57535	0.34009
Others/Florists/ (cross price) ε_{31}*	0.54262	0.06302	0.39497	0.37432
Supermarkets (own) ε_{22}*	-0.45359	-0.66391	-0.59784	-0.49632
Florists/Supermarkets (cross price) ε_{12}*	0.12335	0.16391	0.11732	0.12512
Others/Supermarkets (cross price) ε_{32}*	0.07937	0.30268	0.01436	0.15396
Others (own) ε_{33}*	-0.62199	-0.36570	-0.40933	-0.52827
Florists/Others (cross price) ε_{13}*	0.17452	0.02235	0.08326	0.16503
Supermarkets/Others (cross price) ε_{23}*	0.08576	0.26545	0.02248	0.15623

Table E-3: Uncompensated price elasticities of demand for outlets for three types of fresh-cut flowers.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Arrangements				
Florists (own price) ε_{11}	-0.93634	-0.93370	-0.96591	-0.89302
Supermarkets/Florists (cross price) ε_{21}	0.07714	-0.21472	-0.18642	0.03575
Others/Florists/ (cross price) ε_{31}	-0.50875	-0.37291	-0.23745	-0.55426
Supermarkets (own) ε_{22}	-0.95462	-0.73709	-0.41620	-0.62589
Florists/Supermarkets (cross price) ε_{12}	0.00680	-0.01755	-0.00973	-0.02074
Others/Supermarkets (cross price) ε_{32}	-0.07675	-0.06502	-0.34743	-0.01865
Others (own) ε_{33}	-0.54904	-0.42458	-0.48264	-0.47389
Florists/Others (cross price) ε_{13}	-0.05183	-0.06103	-0.01533	-0.10711
Supermarkets/Others (cross price) ε_{23}	-0.12369	-0.09458	-0.44084	0.05138
Bouquet/Boxes/Corsages				
Florists (own price) ε_{11}	-0.62935	-1.10346	-0.87016	-0.66031
Supermarkets/Florists (cross price) ε_{21}	-0.12416	0.08484	-0.06472	-0.18837
Others/Florists/ (cross price) ε_{31}	-0.49516	0.04453	-0.21563	-0.18147
Supermarkets (own) ε_{22}	-0.54016	-0.43223	-0.81734	-0.48469
Florists/Supermarkets (cross price) ε_{12}	-0.23575	-0.55683	-0.15334	-0.62046
Others/Supermarkets (cross price) ε_{32}	-0.36919	-0.04526	0.07863	0.08219
Others (own) ε_{33}	-0.51822	-0.57631	-0.65407	-0.53054
Florists/Others (cross price) ε_{13}	-0.19718	-0.17684	-0.16250	-0.42609
Supermarkets/Others (cross price) ε_{23}	-0.05551	0.00940	0.03509	0.07017
Single Stems				
Florists (own price) ε_{11}	-0.62977	-0.77030	-0.83321	-0.90682
Supermarkets/Florists (cross price) ε_{21}	-0.42583	-0.08453	-0.00875	-0.02103
Others/Florists/ (cross price) ε_{31}	-0.21944	-0.57687	-0.55090	-0.15930
Supermarkets (own) ε_{22}	-0.26822	-0.50276	-0.63675	-0.46328
Florists/Supermarkets (cross price) ε_{12}	-0.34336	-0.20658	-0.12536	-0.22373
Others/Supermarkets (cross price) ε_{32}	-0.28928	-0.13108	-0.06122	-0.20677
Others (own) ε_{33}	-0.74392	-0.29722	-0.23373	-0.66194
Florists/Others (cross price) ε_{13}	-0.05461	-0.23268	-0.22982	-0.12837
Supermarkets/Others (cross price) ε_{23}	-0.09010	0.00887	0.00667	-0.06892

Table E-4: Compensated price elasticities of demand for outlets for three types of fresh-cut flowers.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Arrangements				
Florists (own price) ε_{11}^*	-0.13255	-0.10322	-0.11053	-0.08440
Supermarkets/Florists (cross price) ε_{21}^*	0.89714	0.64375	0.71427	0.46248
Others/Florists/ (cross price) ε_{31}^*	0.42050	0.33470	0.68401	0.27489
Supermarkets (own) ε_{22}^*	-0.88641	-0.65389	-0.35352	-0.59803
Florists/Supermarkets (cross price) ε_{12}^*	0.07366	0.06294	0.04979	0.03204
Others/Supermarkets (cross price) ε_{32}^*	0.00054	0.00356	-0.28331	0.03547
Others (own) ε_{33}^*	-0.42104	-0.33826	-0.40069	-0.31036
Florists/Others (cross price) ε_{13}^*	0.05889	0.04028	0.06073	0.05236
Supermarkets/Others (cross price) ε_{23}^*	-0.01073	0.01015	-0.36075	0.13555
Bouquet/Boxes/Corsages				
Florists (own price) ε_{11}^*	-0.19454	-0.34026	-0.29680	-0.05731
Supermarkets/Florists (cross price) ε_{21}^*	0.17047	0.22525	0.34474	0.02462
Others/Florists/ (cross price) ε_{31}^*	0.07074	0.28425	0.16681	0.04104
Supermarkets (own) ε_{22}^*	-0.26702	-0.29010	-0.54449	-0.25356
Florists/Supermarkets (cross price) ε_{12}^*	0.16733	0.21569	0.22873	0.03390
Others/Supermarkets (cross price) ε_{32}^*	0.15542	0.19739	0.33347	0.32364
Others (own) ε_{33}^*	-0.22616	-0.48164	-0.50028	-0.36468
Florists/Others (cross price) ε_{13}^*	0.02722	0.12458	0.06807	0.02340
Supermarkets/Others (cross price) ε_{23}^*	0.09655	0.06485	0.19976	0.22894
Single Stems				
Florists (own price) ε_{11}^*	-0.13624	-0.10783	-0.13067	-0.31171
Supermarkets/Florists (cross price) ε_{21}^*	-0.04928	0.23227	0.36891	0.24049
Others/Florists/ (cross price) ε_{31}^*	0.38209	-0.02634	-0.05086	0.32666
Supermarkets (own) ε_{22}^*	-0.02611	-0.34403	-0.48755	-0.30346
Florists/Supermarkets (cross price) ε_{12}^*	-0.02605	0.12536	0.15220	0.13996
Others/Supermarkets (cross price) ε_{32}^*	0.09747	0.14477	0.13634	0.09021
Others (own) ε_{33}^*	-0.47956	-0.11843	-0.08548	-0.41687
Florists/Others (cross price) ε_{13}^*	0.16229	-0.01754	-0.02153	0.17175
Supermarkets/Others (cross price) ε_{23}^*	0.07539	0.11176	0.11864	0.06297

Table E-5: Expenditure elasticities.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Overall fresh-cut flowers:				
Florists η_1	0.97254	1.01801	1.11045	1.07001
Supermarkets η_2	0.95815	0.92112	0.76545	0.87206
Others η_3	1.16293	1.02402	0.65906	0.89261
U.S. Region 1:				
Florists η_1	1.07225	1.02026	1.18537	1.23003
Supermarkets η_2	0.61854	0.95516	0.45060	0.71675
Others η_3	1.13010	0.93460	0.79635	0.59931
U.S. Region 2:				
Florists η_1	1.13355	1.16231	1.14721	1.12332
Supermarkets η_2	0.82675	0.62731	0.49488	0.71602
Others η_3	0.69559	0.87601	0.88577	0.80302
U.S. Region 3:				
Florists η_1	1.13857	1.09382	1.17360	1.18820
Supermarkets η_2	0.45885	0.75373	0.44787	0.53465
Others η_3	1.18499	0.84259	0.74390	0.90001
U.S. Region 4:				
Florists η_1	1.11001	1.06885	1.16463	1.06169
Supermarkets η_2	0.74898	0.88726	0.84998	0.74220
Others η_3	0.91585	0.93720	0.37327	1.08772
Arrangements:				
Florists η_1	0.98137	1.01228	0.99097	1.02088
Supermarkets η_2	1.00116	1.04640	1.04345	0.53876
Others η_3	1.13455	0.86252	1.06752	1.04680
Bouquet/Boxes/Corsage:				
Florists η_1	1.06228	1.83714	1.18599	1.70687
Supermarkets η_2	0.71984	0.33799	0.84697	0.60290
Others η_3	1.38257	0.57705	0.79107	0.62982
Single Stems:				
Florists η_1	1.02775	1.20956	1.18839	1.25891
Supermarkets η_2	0.78415	0.57842	0.63884	0.55322
Others η_3	1.25264	1.00517	0.84585	1.02801

Table E-6: Share elasticities of outlets for arrangements.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Share elasticities:				
Florists (own price)	0.06366	0.06630	0.03409	0.10698
Florists/Supermarkets (cross price)	0.07714	-0.21472	-0.18642	0.03575
Florists/others (cross price)	-0.14081	0.14842	0.15233	-0.14272
Supermarkets (own)	0.04538	0.26291	0.58380	0.37411
Supermarkets/Florists(cross price)	0.00680	-0.01755	-0.00973	-0.02074
Supermarkets/Others(cross price)	-0.05218	-0.24536	-0.57408	-0.35337
Others (own)	0.17552	0.15561	0.45617	0.05573
Others/Florists (cross price)	-0.05183	-0.06103	-0.01533	-0.10711
Others/Supermarkets(cross price)	-0.12369	-0.09458	-0.44084	0.05138
Income (share) Elasticities:				
Florists	-0.01863	0.01228	-0.00903	0.02088
Supermarkets	0.00116	0.04640	0.04345	-0.46124
Others	0.13455	-0.13748	0.06752	0.04680

Table E-7: Share Elasticities of Bouquet/Boxes/Corsage.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Share elasticities:				
Florists (own price)	0.37065	-0.10346	0.12984	0.33969
Florists/Supermarkets (cross price)	-0.12416	0.08484	-0.06472	-0.18837
Florists/others (cross price)	-0.24649	0.01862	-0.06512	-0.15131
Supermarkets (own)	0.45984	0.56777	0.18266	0.51531
Supermarkets/Florists(cross price)	-0.23575	-0.55683	-0.15334	-0.62046
Supermarkets/Others(cross price)	-0.22408	-0.01094	-0.02932	0.10516
Others (own)	0.25269	0.16744	0.12740	0.35592
Others/Florists (cross price)	-0.19718	-0.17684	-0.16250	-0.42609
Others/Supermarkets(cross price)	-0.05551	0.00940	0.03509	0.07017
Income (share) Elasticities:				
Florists	0.06228	0.83714	0.18599	0.70687
Supermarkets	-0.28016	-0.66201	-0.15303	-0.39710
Others	0.38257	-0.42295	-0.20893	-0.37018

Table E-8: Share elasticities of outlets for single stem.

Elasticities	Income Group : 1 (Under $25,000)	Income Group : 2 ($25,000-$49,999)	Income Group : 3 ($50,000-$74,999)	Income Group : 4 (Over $75,000)
Share elasticities:				
Florists (own price)	0.37023	0.22970	0.16679	0.09318
Florists/Supermarkets (cross price)	-0.42583	-0.08453	-0.00875	-0.02103
Florists/others (cross price)	0.05560	-0.14516	-0.15804	-0.07216
Supermarkets (own)	0.73178	0.49724	0.36325	0.53672
Supermarkets/Florists(cross price)	-0.34336	-0.20658	-0.12536	-0.22373
Supermarkets/Others(cross price)	-0.38842	-0.29066	-0.23789	-0.31299
Others (own)	0.14472	0.22381	0.22316	0.19728
Others/Florists (cross price)	-0.05461	-0.23268	-0.22982	-0.12837
Others/Supermarkets(cross price)	-0.09010	0.00887	0.00667	-0.06892
Income (share) Elasticities:				
Florists	0.02775	0.20956	0.18839	0.25891
Supermarkets	-0.21585	-0.42158	-0.36116	-0.44678
Others	0.25264	0.00517	-0.15415	0.02801

Table E-9: Share elasticities of outlets for fresh-cut flowers in U.S. region 1.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Share elasticities:				
Florists (own price)	0.23828	0.05836	0.02799	0.05343
Florists/Supermarkets (cross price)	-0.12912	-0.08377	0.00772	-0.06045
Florists/others (cross price)	-0.10916	0.02541	-0.03571	0.00702
Supermarkets (own)	0.39310	0.20518	0.38680	0.40246
Supermarkets/Florists(cross price)	-0.11949	-0.02853	-0.11989	-0.10652
Supermarkets/Others(cross price)	-0.27361	-0.17665	-0.26691	-0.29594
Others (own)	0.07356	0.12666	-0.06140	0.23570
Others/Florists (cross price)	-0.19104	-0.05009	-0.09347	-0.17694
Others/Supermarkets(cross price)	0.11748	-0.07657	0.15488	-0.05876
Income (share) Elasticities:				
Florists	0.07225	0.02026	0.18537	0.23003
Supermarkets	-0.38146	-0.04484	-0.54940	-0.28325
Others	0.13010	-0.06540	-0.20365	-0.40069

Table E-10: Share elasticities of outlets for fresh-cut flowers in U.S. region 2.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Share elasticities:				
Florists (own price)	0.13591	0.03865	-0.01257	0.02973
Florists/Supermarkets (cross price)	-0.22246	0.07251	0.06530	0.05486
Florists/others (cross price)	0.08655	-0.11116	-0.05273	-0.08459
Supermarkets (own)	0.28170	0.26931	0.55445	0.20488
Supermarkets/Florists(cross price)	-0.15767	-0.09896	-0.10098	-0.05804
Supermarkets/Others(cross price)	-0.12403	-0.17035	-0.45347	-0.14684
Others (own)	-0.00222	0.07113	0.14828	0.07076
Others/Florists (cross price)	-0.11179	-0.10200	-0.03366	-0.09500
Others/Supermarkets(cross price)	0.11401	0.03087	-0.11462	0.02424
Income (share) Elasticities:				
Florists	0.13355	0.16231	0.14721	0.12332
Supermarkets	-0.17325	-0.37269	-0.50512	-0.28398
Others	-0.30441	-0.12399	-0.11423	-0.19698

Table E-11: Share elasticities of outlets for fresh-cut flowers in U.S. region 3.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Share elasticities:				
Florists (own price)	0.12380	0.11407	-0.03179	0.11947
Florists/Supermarkets (cross price)	-0.07156	-0.23011	0.09407	-0.04394
Florists/others (cross price)	-0.05224	0.11604	-0.06228	-0.07553
Supermarkets (own)	0.54817	0.51053	0.49690	0.46763
Supermarkets/Florists(cross price)	-0.16181	-0.12764	-0.10599	-0.14889
Supermarkets/Others(cross price)	-0.38636	-0.38290	-0.39091	-0.31874
Others (own)	0.03601	0.11440	0.07466	0.11711
Others/Florists (cross price)	-0.10056	-0.08025	-0.03582	-0.15877
Others/Supermarkets(cross price)	0.06454	-0.03415	-0.03884	0.04166
Income (share) Elasticities:				
Florists	0.13857	0.09382	0.17360	0.18820
Supermarkets	-0.54115	-0.24627	-0.55213	-0.46535
Others	0.18499	-0.15741	-0.25610	-0.09999

Table E-12: Share elasticities of outlets for fresh-cut flowers in U.S. region 4.

Elasticities	**Income Group : 1 (Under $25,000)**	**Income Group : 2 ($25,000-$49,999)**	**Income Group : 3 ($50,000-$74,999)**	**Income Group : 4 (Over $75,000)**
Share elasticities:				
Florists (own price)	0.03140	0.20981	-0.02314	0.12337
Florists/Supermarkets (cross price)	-0.08475	-0.10287	-0.02498	-0.06990
Florists/others (cross price)	0.05335	-0.10694	0.04811	-0.05347
Supermarkets (own)	0.39753	0.13022	0.28127	0.34615
Supermarkets/Florists(cross price)	-0.09730	-0.08409	-0.04834	-0.10024
Supermarkets/Others(cross price)	-0.30022	-0.04614	-0.23293	-0.24591
Others (own)	0.10585	0.10919	0.19942	0.10327
Others/Florists (cross price)	-0.04410	-0.19457	-0.09315	-0.08483
Others/Supermarkets(cross price)	-0.06175	0.08538	-0.10627	-0.01844
Income (share) Elasticities:				
Florists	0.11001	0.06885	0.16463	0.06169
Supermarkets	-0.25102	-0.11274	-0.15002	-0.25780
Others	-0.08415	-0.06280	-0.62673	0.08772

APPENDIX F

PROMOTION ELASTICITIES AND SIMULATIONS FOR THREE TYPES OF FRESH-CUT FLOWERS AND FOUR US REGIONS

Table F-1: Promotion elasticities of retail outlets for fresh-cut flowers in four US regions.

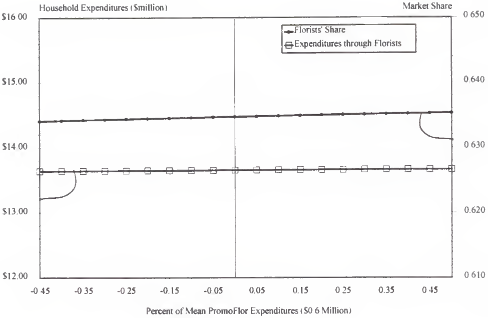
Promotion Elasticities	**Income Group :1 (Under $25,000)**		**Income Group :2 ($25,000 to $49,999)**		**Income Group :3 ($50,000 to $74,999)**		**Income Group :4 (Over $75,000)**	
	Elast.	S.E	Elast.	S.E	Elast.	S.E	Elast.	S.E
US Region 1:								
PromoFlor: Florists	-0.00862	0.01668	0.02929*	0.01022	0.00372	0.01476	-0.01391	0.01894
PromoFlor: Supermarkets	0.04386	0.03943	-0.08561*	0.03006	-0.03223	0.03610	0.01519	0.03654
PromoFlor: Others	-0.03523	0.03535	0.05632*	0.02341	0.02850	0.02747	-0.00128	0.03253
Brand Advertising: Florists	0.00999	0.04971	-0.03213	0.02428	0.02114	0.03797	0.04794	0.05513
Brand Advertising: Supermarkets	0.00476	0.11768	-0.05869	0.07161	-0.09910	0.09410	0.14601	0.10351
Brand Advertising: Others	-0.01476	0.10986	0.09083	0.05579	0.07796	0.07387	-0.19164*	0.09528
US Region 2:								
PromoFlor: Florists	-0.02145	0.01337	0.00291	0.00884	-0.00075	0.01676	0.02339	0.02379
PromoFlor: Supermarkets	0.03398	0.02773	0.01056	0.02109	0.01065	0.04752	0.00531	0.05794
PromoFlor: Others	-0.01252	0.02307	-0.01347	0.01468	-0.00991	0.03430	-0.02870	0.04508
Brand Advertising: Florists	0.02725	0.03839	0.05557*	0.02529	-0.00752	0.04275	-0.02823	0.05562
Brand Advertising: Supermarkets	0.06746	0.07868	-0.12218*	0.06041	-0.00904	0.12140	-0.11126	0.12863
Brand Advertising: Others	-0.09472	0.06391	0.06662	0.04181	0.01656	0.08854	0.13949	0.09730
US Region 3:								
PromoFlor: Florists	-0.01332	0.01379	-0.01536	0.00978	0.01115	0.00959	-0.01352	0.01700
PromoFlor: Supermarkets	0.01052	0.03093	0.07569*	0.02534	-0.06570	0.03676	0.03341	0.04091
PromoFlor: Others	0.00280	0.02380	-0.06034*	0.01945	0.05455	0.03090	-0.01989	0.03157
Brand Advertising: Florists	0.03417	0.03353	0.06987*	0.02404	-0.00714	0.02607	0.04031	0.04238
Brand Advertising: Supermarkets	-0.06733	0.07799	-0.15267*	0.06152	-0.01322	0.09376	0.01669	0.10628
Brand Advertising: Others	0.03316	0.06200	0.08280	0.04721	0.02036	0.07681	-0.05701	0.08528
US Region 4:								
PromoFlor: Florists	0.02125	0.01971	0.03751*	0.02020	-0.02934	0.01116	0.01647	0.02084
PromoFlor: Supermarkets	-0.03033	0.04151	-0.04149	0.03381	0.02557	0.03736	0.02180	0.02878
PromoFlor: Others	0.00908	0.03529	0.00398	0.02446	0.00377	0.03306	-0.03827	0.02127
Brand Advertising: Florists	-0.07321	0.05162	-0.01049	0.05623	0.06074	0.02945	0.06081	0.05875
Brand Advertising:	0.14561	0.10632	-0.02058	0.09393	-0.05183	0.09993	-0.09983	0.08288
Brand Advertising: Others	-0.07240	0.08882	0.03107	0.06775	-0.00890	0.08825	0.03901	0.05871

*Indicates significance at 0.05 or less; Elast.=Elasticities and S.E = Standard Error.

Table F-2: Promotion elasticities of retail outlets for three types fresh-cut flowers.

Promotion Elasticities	**Income Group :1 (Under $25,000)**		**Income Group :2 ($25,000 to $49,999)**		**Income Group :3 ($50,000 to $74,999)**		**Income Group :4 (Over $75,000)**	
	Elast.	S.E	Elast.	S.E	Elast.	S.E	Elast.	S.E
Arrangements:								
PromoFlor: Florists	0.00705	0.00904	-0.00062	0.00569	-0.00561	0.00543	0.00552	0.00980
PromoFlor: Supermarkets	-0.03738	0.05254	-0.05693*	0.02558	-0.10837	0.06564	-0.03055	0.05425
PromoFlor: Others	0.03033	0.05041	0.05755*	0.02288	0.11399	0.06096	0.02253	0.05363
Brand Advertising: Florists	0.06121	0.02607	0.04115*	0.01730	-0.01695	0.01537	0.00561	0.03053
Brand Advertising: Supermarkets	-0.10810	0.15033	-0.15663*	0.07721	0.32011	0.18473	-0.16904	0.17268
Brand Advertising: Others	0.04689	0.14428	0.11548	0.06909	-0.30316	0.17153	0.16344	0.17002
Bouquet/Boxes/Corsage:								
PromoFlor: Florists	0.01208	0.02227	0.00355	0.01796	-0.01283	0.02011	-0.02215	0.02483
PromoFlor: Supermarkets	0.01938	0.02412	0.01478	0.01396	0.02282	0.02155	0.03462	0.02219
PromoFlor: Others	-0.03146	0.01929	-0.01832	0.01181	-0.00989	0.01576	-0.01247	0.02228
Brand Advertising: Florists	-0.09845	0.06446	0.21749*	0.05761	0.05889	0.05271	0.06698	0.07478
Brand Advertising: Supermarkets	0.04114	0.07194	-0.15138*	0.04193	-0.00603	0.05608	0.04337	0.06521
Brand Advertising: Others	0.05732	0.05644	-0.06611*	0.03583	-0.05286	0.04088	-0.11035	0.06884
Single Stems:								
PromoFlor: Florists	-0.00138	0.02360	0.02243	0.01569	-0.01248	0.01633	-0.00276	0.02223
PromoFlor: Supermarkets	0.00277	0.02773	-0.01053	0.02799	0.00721	0.03737	0.05759	0.02874
PromoFlor: Others	-0.00138	0.02166	-0.01191	0.01841	0.00527	0.03204	-0.05482	0.02482
Brand Advertising: Florists	0.05201	0.05945	-0.00268	0.03958	0.02390	0.04129	-0.04603	0.06329
Brand Advertising: Supermarkets	0.01609	0.07185	-0.00075	0.06994	-0.05049	0.09275	0.06918	0.08114
Brand Advertising: Others	-0.06810	0.05464	0.00343	0.04734	0.02658	0.07958	-0.02315	0.06637

I PromoFlor Impact on Florist Share



II Brand Promotion Impact on Florist Share

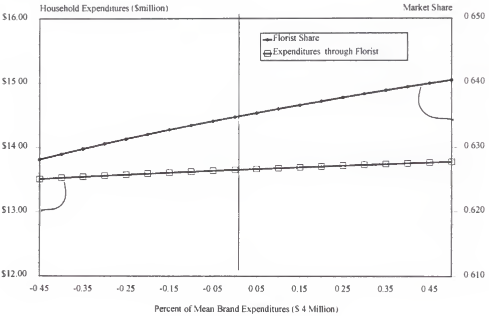
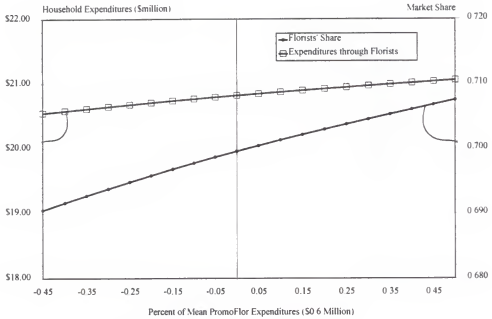


Figure F-1: PromoFlor and brand promotion impacts on florist share among income group (under $25,000).

I PromoFlor Impact on Florist Share



II. Brand Promotion Impact on Florist Share

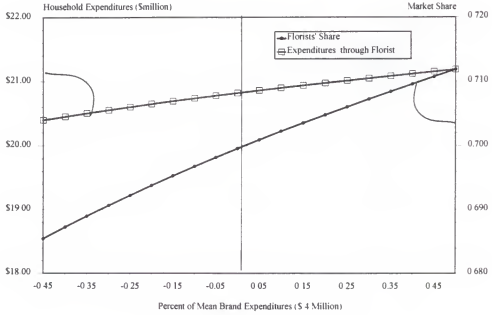
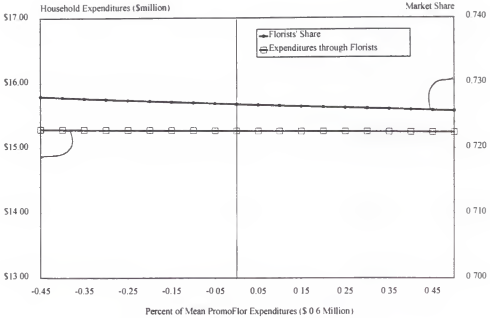


Figure F-2: PromoFlor and brand promotion impacts on florist share among income group ($25,000 to $49,999).

I. PromoFlor Impact on Florist Share



II. Brand Promotion Impact on Florist Share

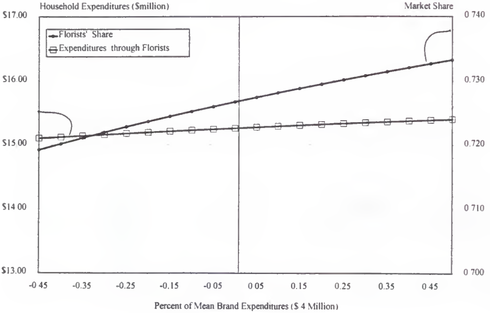
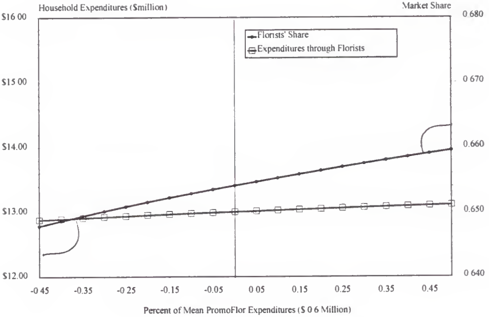


Figure F-3: PromoFlor and brand promotion impacts on florist share among income group ($50,000 to $74,999).

I PromoFlor Impact on Florist Share



II. Brand Promotion Impact on Florist Share

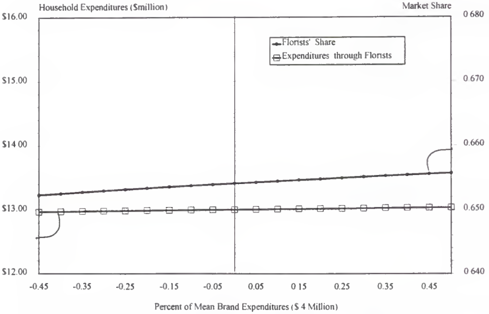
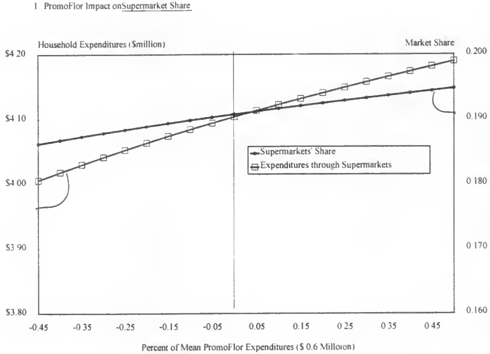


Figure F-4: PromoFlor and brand promotion impacts on florist share among income group (over $75,000).



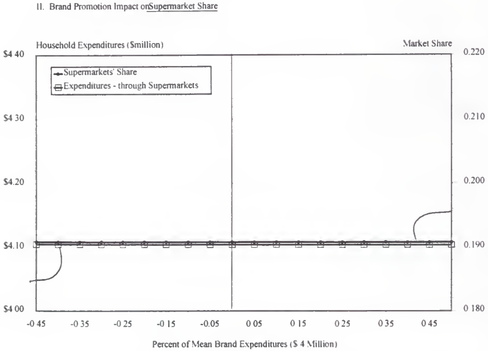
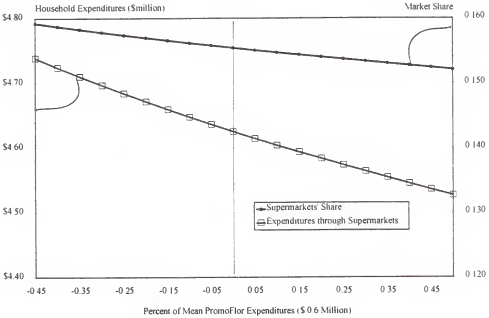


Figure F-5: PromoFlor and brand promotion impacts on supermarket share among income group (under $25,000).

I PromoFlor Impact on Supermaket Share



II. Brand Promotion Impact on Supermarket Share

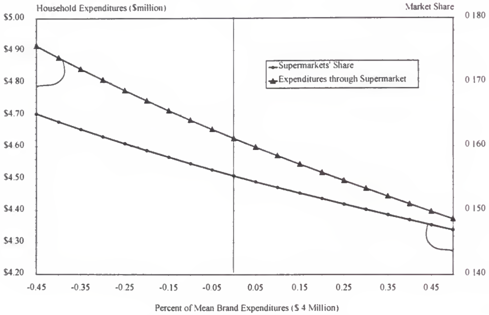
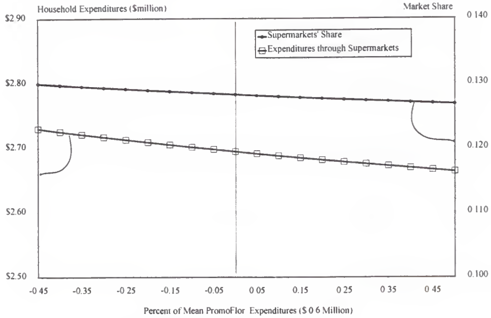


Figure F-6: PromoFlor and brand promotion impacts on supermarket share among income group ($25,000 to $49,999).

I. PromoFlor Impact on Supermaket Share



II. Brand Promotion Impact on Supermarket Share

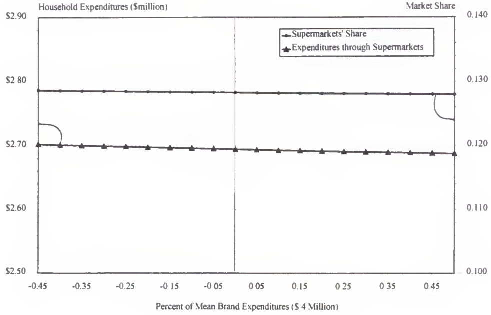
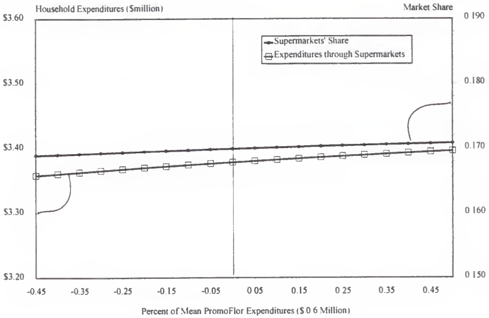


Figure F-7: PromoFlor and brand promotion impacts on supermarket share among income group ($50,000 to $74,999).

I PromoFlor Impact on Supermaket Share



II. Brand Promotion Impact on Supermarket Share

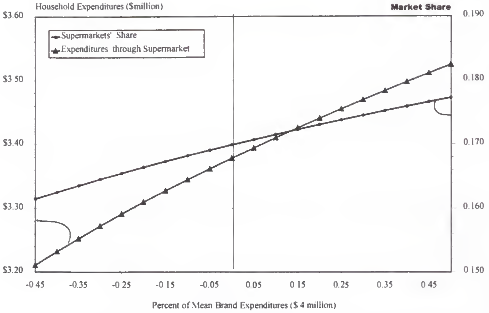
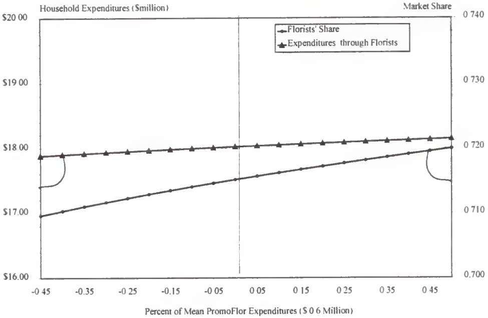


Figure F-8: PromoFlor and brand promotion impacts on supermarket share among income group (over $75,000).

I. PromoFlor Impact on Florists Share



II. Brand Promotion Impact on Florists Share

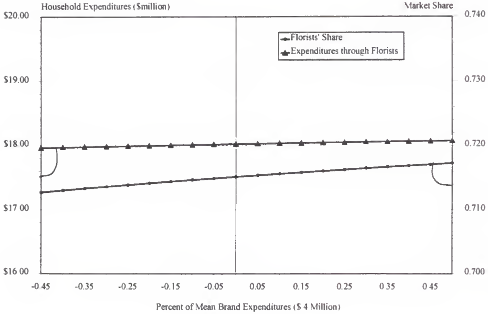
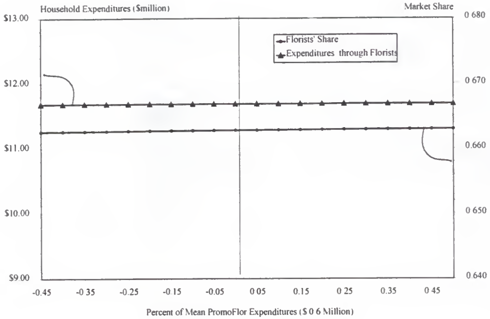


Figure F-9: PromoFlor and brand promotion impacts on florist share among all income group in US region 1.

I PromoFlor Impact on Florists Share



II. Brand Promotion Impact on Florist Share

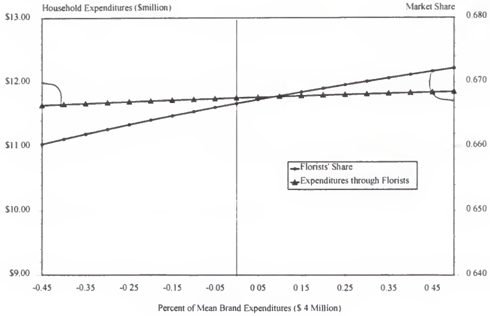
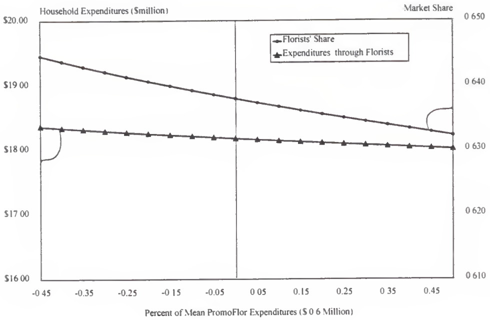


Figure F-10: PromoFlor and brand promotion impacts on florist share among all income group in US region 2.

I PromoFlor Impact on Florists Share



II. Brand Promotion Impact on Florist Share

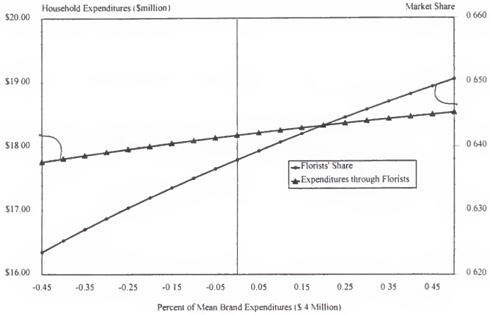
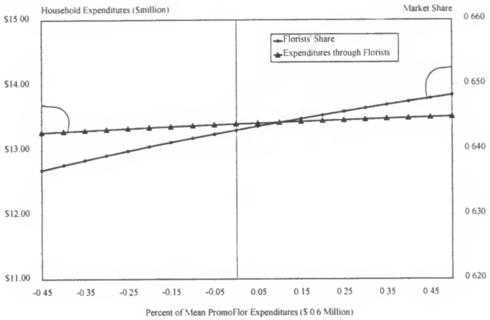


Figure F-11: PromoFlor and brand promotion impacts on florist share among all income group in US region 3.

I PromoFlor Impact on Florist Share



II. Brand Promotion Impact on Florist Share

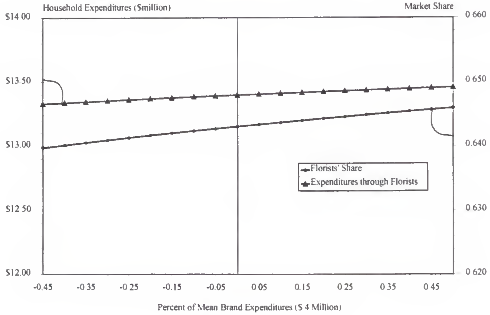
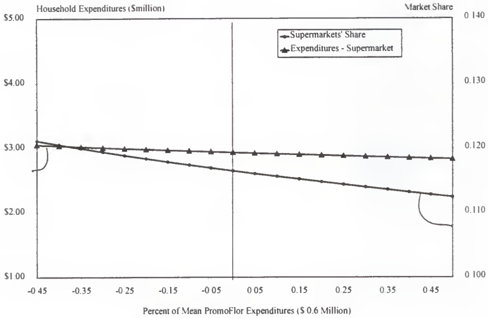


Figure F-12: PromoFlor and brand promotion impacts on florist share among all income group in US region 4.

I. PromoFlor Impact on Supermarkets Share



II. Brand Promotion Impact on Supermarket Share

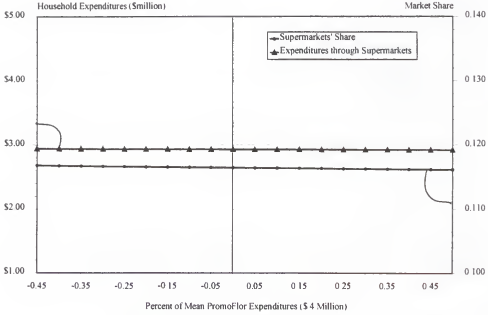
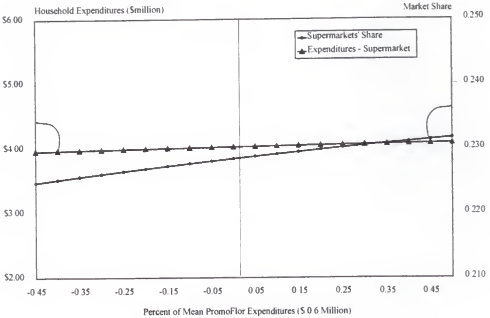


Figure F-13: PromoFlor and brand promotion impacts on supermarket share among all income group in US region 1.

I PromoFlor Impact on Supermarket Share for



II. Brand Promotion Impact on Supermarket Share

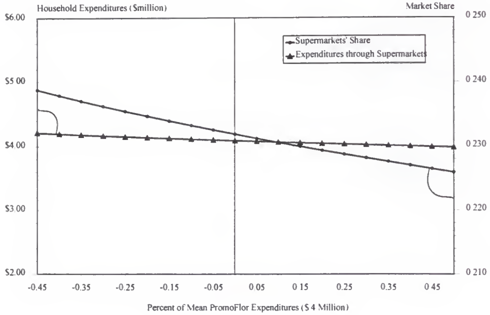
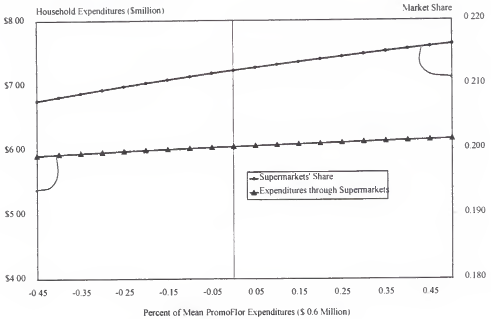


Figure F-14: PromoFlor and brand promotion impacts on supermarket share among all income group in US region 2.

I. PromoFlor Impact onSupermarket Share



II. Brand Promotion Impact onSupermarket Share

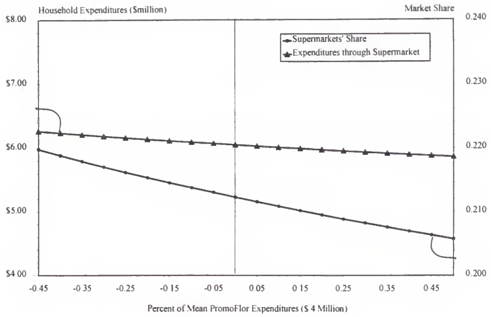
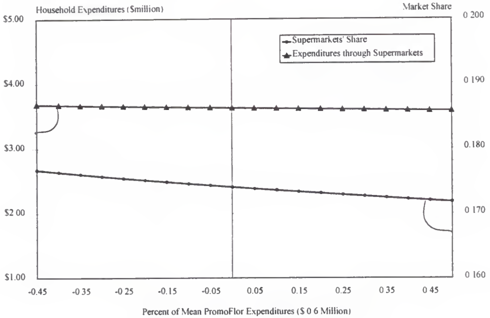


Figure F-15: PromoFlor and brand promotion impacts on supermarket share among all income group in US region 3.

I. PromoFlor Impact on Supermarket Share



II. Brand Promotion Impact on Supermarket Share

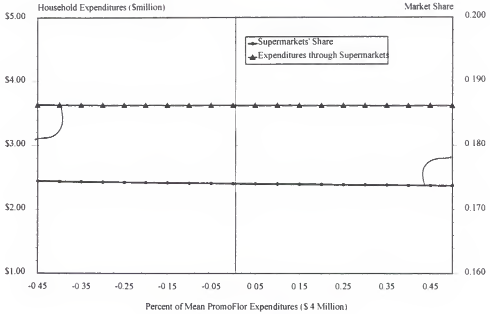
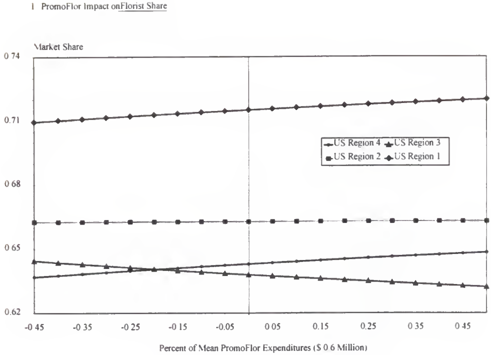


Figure F-16: PromoFlor and brand promotion impacts on supermarket share among all income group in US region 4.



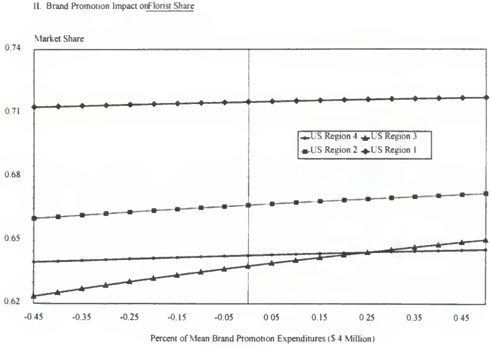
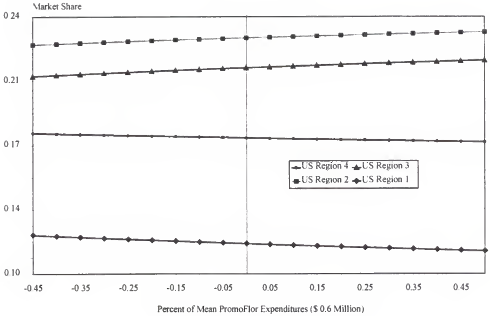


Figure F-17: PromoFlor and brand promotion impacts on florist share among all income group in all four US regions.

I PromoFlor Impact on Supermarket Share



II. Brand Promotion Impact on Supermarket Share

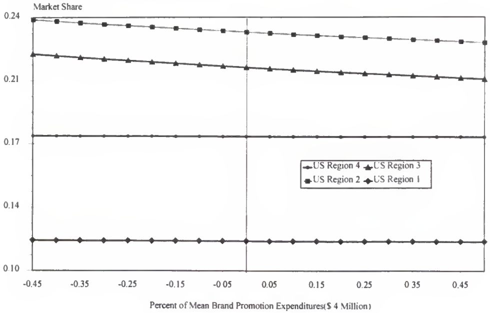


Figure F-18: PromoFlor and brand promotion impacts on supermarket share among all income group in all four US regions.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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